MICRO HELIS–THE NEW BREED



p. 30

MODEL Airplane NEWS

75th ANNIVERSARY 1929-2004

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A pair of lightweight WW I backyard flyers
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***ON THE COVER:** the new Curtiss P-40N Warhawk from Hobby Lobby "smiles" for the camera! With its distinctive Flying Tiger shark's teeth nose art, this all-foam backyard fighter is ready to chase any target of opportunity! See page 40 for the full story (photo by Deron Neblett). ON THIS PAGE: settling into a brief hover, the new Great Planes Extra 300S shows off its impressive underwing markings. For sport fliers or 3D fiends alike, this new sport-scale flyer is a must-have! See Jerry Smith's review on page 68 (photo by Jerry Smith).*

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EDITORIAL

BY DEBRA CLEGHORN

MICRO HELI REVOLUTION

The new breed of miniature, electric-powered micro helicopters can hover, fly forward, backwards, upside-down and practically inside out and then land—right on target!—on your coffee table. These mini machines have taken the RC world by storm and, in this issue, expert helicopter pilot and associate editor Rick Bell offers information on micro heli setup, hop-up parts and accessories and an in-depth look at 11 of these amazing flyers. Airplane-only pilots will be interested to learn that many of these micro helicopters don't even require helicopter-specific radios! Check them out on page 30.



Part of the appeal of backyard flyers is that they can be so easy and inexpensive to build. Spend a few dollars for materials and then add an inexpensive motor and radio gear, and you'll be flight-ready in just a week or less. In this issue, we feature not one but two such models in "The Dogfighters" on page 86. Keith Sparks' WW II S.E.5a and Fokker D.VII feature basic foam construction and use standard GWS motors and radio equipment. They're also great flyers, indoors and out, and they can be dressed up as much as you'd like. If you're in the mood for a quick project, don't miss this one!



Speaking of backyard flyers, there's nothing we like more than taking a great flying plane and turning it into an extraordinary one. In our "Backyard Flyer" column, Rick Bell adds muscle to one of his favorites—a WattAge MiG—by adding a brushless motor, a new impeller and structural reinforcements. The result? A 20mph performance boost (not that its original 50mph speed was sluggish by any means!). Rick also dressed up the MiG, so now it even *looks* fast. Check out his hop-ups on page 110.

So you've envied the pro fliers at the field who have fancy 8- to 10-channel transmitters that can do everything but fly the plane solo, but you don't want to want to break the bank for a new radio. Well, JR has the answer: its new 6-channel XP8106 has all the high-end programmable features you could ever want with a price tag that you can afford. Interested? Senior tech editor Gerry Yarrish shares an in-depth look at this new unit on page 100.

Soft landings!

MODEL AIRPLANE NEWS 75th ANNIVERSARY 1929-2004

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SOARING WITH GAS EAGLES

I was very impressed by your April 2004 issue with the Great Planes Christen Eagle II biplane on the cover. My wife gave me one for Christmas, and I'm thinking about using a gasoline engine for power. The author, John Reid, made it sound as though the Fuji 50cc engine is a good choice. Is there anything else you can add to what he has already said about this engine? I have only basic experience with gas engines and need all the help I can get. Thanks.

Bill Paez,
Detroit, MI

Bill, the Fuji 50 engine is a good match for the new Christen Eagle, and it fits nicely in that big cowl. The main thing about gas engines is that you must securely attach them to the firewall and use good-quality hardware. Use ¼-20 stainless-steel bolts and plenty of thread-locking compound. Gas engines tend to produce more vibration than glow engines, so it is important that they're securely attached. Also, make sure you properly balance the prop. Install a kill-switch to positively shut off your engine so it can't be started accidentally. After every flight, thoroughly inspect your engine as well as the rest of the model. Have fun with your new gas-powered Christen Eagle! GY



TWO BATTERIES BETTER THAN ONE?

I would like to use two receiver battery packs (and two switches) in my plane for a redundant setup. I have 9 servos, but I am not sure which battery capacity to use. Also, should I use 4- or 5-cell battery packs? I have heard all the pro's and cons from several of my club members. What do you suggest?

Alfred Johnson,
MSgt. USAF (Ret.) [email]

Alfred, for most of my models, I simply use a 4-cell, high-capacity battery (1800 to 2000mAh), and I use a heavy-duty switch harness from JR. I have a field charger and I top off my packs before every flight. With some of my big stuff, I have used two 5-cell, 1200mAh Ni-Cd battery packs (with two separate switches), and this setup has performed well. Running 6V battery packs does give more servo speed, but the packs will also be drained a bit faster than 4-cell packs because of the increased voltage. When you connect two complete battery systems to a receiver (one in the battery port and the other in an auxiliary channel), you basically connect the two in parallel and combine their capacities, while the voltage remains the same. As a rule, use only battery packs of the same voltage and capacity when you install a redundant



system. For insurance, it is important to properly maintain your equipment and cycle your packs on a regular basis. Don't gamble: one well-maintained pack is better than two old or questionable ones. *GY*

HEAVY METAL?

Looking through the latest issue, I found this glaring mistake. On page 112, in the article "Scale Techniques: Working with Aluminum" by Dick van Mourik, the material—about 0.256 and 0.128 inch thick, as quoted in the text—seems a bit on the thick side! I think the decimal is in the wrong place. It should probably be 0.0128 and 0.0256. Other than that, I enjoyed the column.

Jerry Smith,
Acworth, GA

Jerry, yes, you are correct! Those darn decimal points jumped over one too many places; ¼- to ⅛-inch aluminum would indeed be too thick for forming cowls—unless, of course, we're talking about full-size aircraft! Thanks for pointing out the error! *GY*



HOVER STICK

I read with interest your GWS Slow Stick hop-up article in the March issue. It shows a picture of a gearbox for the Mega brushless motor you used that looks very light. Where did you get that gearbox? I need a gearbox with a 2:1 or 2.5:1 ratio for a Mega 16/15/5 brushless motor that I plan to install in a scale FW-190 that will weigh around 25 ounces. Because it's a warbird, I am trying to keep it as light as I can for a great performance. Thanks for your help.

Moses Huang
[email]

Moses, the gearbox I used is actually two parts: the gearbox itself and a mount for the motor. I obtained the gearbox from Mega Motor USA (megamotorusa.com), and it's screwed directly to the motor. Its gear ratio is 2.8:1, which is very close to the 2.5:1 ratio that you're looking for. The motor mount is a GWS item (no. EMM400T) from e-flightline.com. It is made to slide onto a stick, and a rubber band holds it in place. Good luck with your Focke-Wulf, and send us a picture or two for "Pilot Projects" when you've completed it. *RB*

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Flex Mounts are easy to install -- no drilling or tapping. They are light weight (the .50 to .80 size weighs only 39 grams/1.38 oz complete). They help protect your airframe and electronics by absorbing harmful vibration. And they help reduce noise.

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AIR SCOOP

by the Model Airplane News *crew*

NEW PRODUCTS hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. For every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!



SIG MFG. CO.
Nitro Rascal

With the new Nitro Rascal, Sig now brings the classic lines of its popular Rascal ARF to nitro. This light plane outperforms nearly all others in its class. Like the electric Rascal, the Nitro Rascal is assembled from the finest balsa and plywood and is then expertly covered with Oracover polyester film in a classic two-color trim. All the major hardware is included. Specifications: wingspan—49 in.; length—32.5 in.; wing area—324 sq. in.; weight—18 to 20 oz.; engine—0.061 to 0.074 2-stroke; $110.

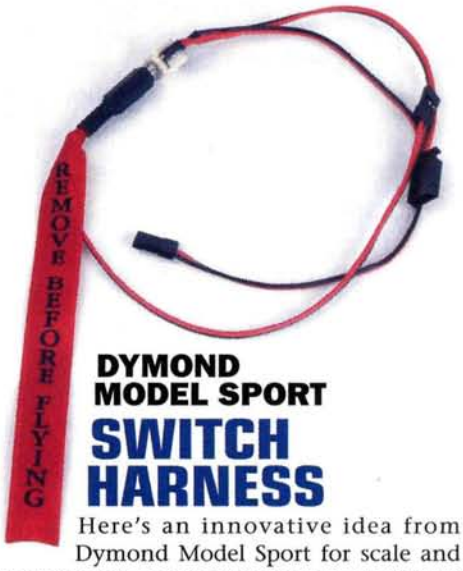
Sig Mfg. Co. Inc. (800) 247-5008; sigmfg.com.



EP SAILOR
THE WORLD MODELS

Known for its great-flying sport, warbird and pattern models, The World Models has added a new, electric-powered glider to its line of ARFs: the EP Sailor. This 3-channel, motorized glider is available in white and yellow color schemes and features a docile, flat-bottom airfoil and a two-piece, removable, poly-dihedral wing for added stability. The kit includes a 550 geared motor and a folding propeller. Priced at $100, the EP Sailor makes a great first airplane for any beginner and is a fun sport glider for the sport modeler who wants a quick-to-assemble model for lunchtime thermal hunting.

The World Models Mfg. Co. Ltd.; distributed in the U.S. by AirBorne Models (925) 371-0922; theworldmodels.com; airborne-models.com.



DYMOND MODEL SPORT
SWITCH HARNESS

Here's an innovative idea from Dymond Model Sport for scale and sport fliers: a new on/off switch harness that requires plug removal before flight. The plug has a large "Remove before flying" flag that reminds you to turn on your radio. Pull the plug out, and the flight-pack system will turn on; insert the plug, and everything will be turned off. This switch harness is great for scale looks and is easy to install; you'll only have to drill a ¼-inch hole in the fuselage. The plug includes a charging jack outside the plane for easy charging access.

Dymond Model Sport (858) 495-0092; rc-dymond.com.

FUTABA
7C RADIO



The new Futaba 7C radio puts you in complete control of your aircraft with digital servo technology. Nearly as sophisticated as Futaba's 9C radio, the 7C sports the Dial-N-Key, so programming the radio is a breeze. Control is maximized with toggle switches that are positioned for easy access, which allows the pilot to keep his eyes on the model. Every switch is fully proportional and can be assigned to nearly any function. Working from either the Basic or the Advanced menus on a large, 72x32mm LCD screen, the pilot can take advantage of: 10-model memory, dual rate/exponential, EPA, subtrims, servo-reversing, four preset mixes and three programmable mixes. Price (depending on configuration): $ 299.99 to $469.99.

Futaba Corp. of America; distributed by Great Planes Model Distributors Co. (800) 682-8948; (217) 398-6300; futaba-rc.com.



GREAT PLANES
MICRO WHIZZ

Don't let its small size fool you; this ARF aerobat delivers giant performance! Inverted flight, snaps, hovering—the Micro Whizz's oversize control surfaces and symmetrical airfoil can deliver them all. With a carbon-fiber boom fuselage and MonoKote-covered balsa wing and tail, the Micro Whizz can be assembled in just an evening or two. It comes with a generous hardware and accessories package that includes wire tailskid, wide-stance landing gear and big foam wheels. Specs: wingspan—32.1 in.; wing area—355 sq. in.; weight—16 to 20 oz.; length—27.5 in.; radio required—4-channel w/3 microservos; motor required—Speed 280 geared 5.1:1. You'd be hard-pressed to find better performance for only $99.99.
Great Planes Model Mfg. (217) 398-6300; (800) 682-8948; greatplanes.com.

RC SHOWCASE
ROTO 35



Well-known for its high-quality, giant-scale gasoline engines, RC Showcase is now the exclusive U.S. distributor for a new model airplane gas-engine line. Designed by a world-famous Czech model-engine designer and manufactured by Strojina CITA s.r.o of the Czech Republic, the Roto 35 is the first U.S. offering. This engine features an electronic-processor-controlled ignition and rear rotary-valve induction and is recommended for use with 18x10, 19x10 and 20x10 propellers. It produces 1,400 to 8,500rpm and costs $425 with muffler and mount. Roto engines are robust and powerful, and these lower-cost powerplants will be attractive to the sport-minded and serious modeler alike. To round out the engine line, a 25cc single, a 50cc twin and a 70cc twin-opposed engine will also be introduced this year.
RC Showcase (301) 374-2197; rcshowcase.com.



KONTRONIK
Electronic Power Systems

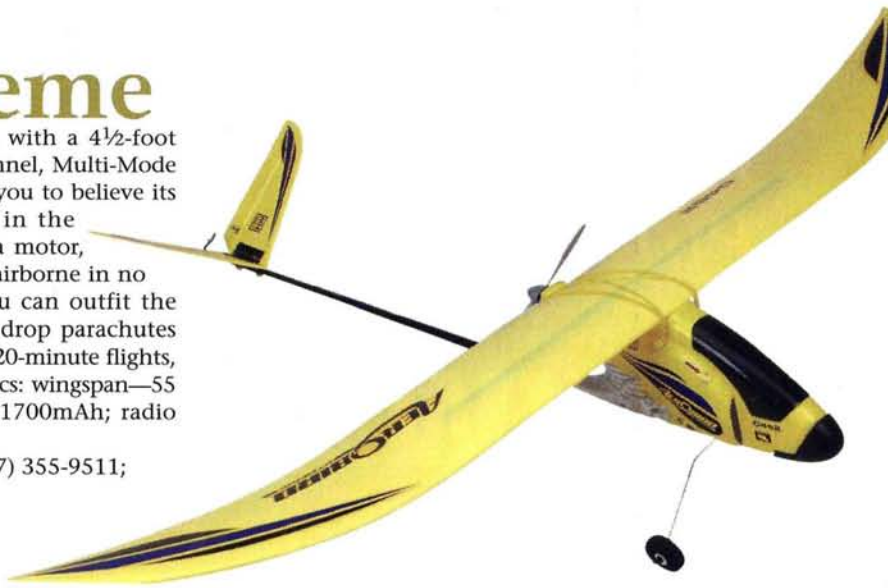
Great Planes is now the exclusive U.S. distributor for Kontronik high-end electric flight products. With brushless motors, ESCs and gear drives that match the performance of glow engines and the added simplicity of plug-and-play, Kontronik is taking a lead in the electric flight revolution. All Kontronik Brushless ESCs can be used with "sensored" and "sensorless" motors and include: soft-start, anti-drift, temperature and current overload protection, a current-limiting circuit, auto-programming mode for quick and easy setup and rpm control to govern the main rotor speed on a model helicopter.

The "Smile" Brushless ESCs are competitively priced and are designed for easy operation. The programmable Jazz Brushless ESCs have more features for the advanced pilot. All Kontronik brushless motors include machine-pressed winds, durable steel cans and 89-percent maximum efficiency. The 25 to 45A Fun 400 motors are ideal for small, fast airplanes, such as Speed 400 racers and ducted-fan models. The more powerful Fun 480 runs in the 30 to 55A range, and the Fun 500 and Fun 600 motors are great for F5B class models and larger scale models that require a power system that can operate in the 45 to 65A range. All the Kontronik products are sold separately and in sets for easy set up and installation.
Kontronik; distributed by Great Planes Model Distributors (800) 682-8948; (217) 398-6300; greatplanes.com.



HOBBYZONE
Aerobird Xtreme

Are you ready for the ultimate Firebird? Equipped with a 4½-foot wing, a powerful 540 motor and HobbyZone's 3-channel, Multi-Mode control system, this bird must be seen in action for you to believe its speed and maneuverability. Like all the planes in the HobbyZone line, the Aerobird Xtreme comes with a motor, radio, charger, battery—everything you need to get airborne in no time. And if you want even more excitement, you can outfit the Xtreme with HobbyZone's X-Ports to take photos, drop parachutes and even engage other pilots in sonic combat. With 20-minute flights, the Aerobird Xtreme offers performance to please. Specs: wingspan—55 in.; motor included—540; battery included—6-cell, 1700mAh; radio included—3-channel, FM proportional.
HobbyZone; distributed by Horizon Hobby Dist. (217) 355-9511; hobbyzonesports.com.





WATTAGE

Cessna Airmaster 165

With its classic good looks and great flight performance, this ARF park flyer is hard to resist. It features a molded-plastic fuselage with fully built-up tail and balsa wing that are covered with iron-on film. With a 370 geared motor in its nose, the Airmaster can handle all 3-channel aerobatics and has plenty of power for fast climbs and vertical maneuvers. Scale details include wheel pants, gear-leg fairings and the scale "bumped" radial cowl. A steerable tailwheel ensures easy taxiing and scale takeoffs. The Airmaster comes with a one-piece wing, scale decals, all necessary hardware, landing gear and a detailed assembly manual. Cost? Just $94.95! Specs: wingspan—30.5 in.; length—24.75 in.; wing area—170 sq. in.; weight—16.25 to 17 oz.; motor required—geared 370; radio required—3-channel w/2 microservos.

WattAge; distributed by Global Hobby Distributors (800) 854-8471; (714) 963-0133; globalhobby.com.

FMA DIRECT

FS8 CO-PILOT FAIL-SAFE RECEIVER SYSTEM

FMA Direct continues to push the RC control envelope, and it now offers the most sophisticated, onboard control system you could ever want! The FS8 Co-Pilot RC receiver system features built-in digital signature recognition, fail-safe operation, infrared flight stabilization and an impressive telemetry system for recording model flight data.



For detailed receiver and flight-stabilization data analysis, it comes with Co-Pilot Viewer software that's compatible with Windows 98 (and later) PC operating systems.

The system features universal operation and is compatible with negative and positive shift transmitters. It stabilizes all model configurations including dual aileron servos, quad flaps, elevons, V-tail, complex transmitter mixes, digital servos and helicopter CCPM setups.

The control system comes with the FS8 Co-Pilot receiver, a pitch/roll sensor, a button and LED module and nameplate, Velcro attachment tape and a system hookup ribbon cable. Optional components include a vertical sensor with ribbon cable, a low-profile button and LED module for helicopters, a serial interface module and an FS Flight recorder.

To use the system, just control your model as you normally would; when you center the control sticks, it will take over and return your model to level flight. The FS-8 is an excellent training tool for beginners, and advanced pilots find that it improves flight and landing stability in windy conditions. Price: $199.95 to $249.95.

FMA Direct (800) 343-2934; (301) 668-7615; fmadirect.com.



LRP

Motors and ESCs

Now that much of the focus in high-performance electrics has shifted to brushless technology, it's easy to forget the number of high-quality brushed motors that can rival a brushless' performance for a fraction of the price. The LRP Zenit motors range from 480 (perfect for adding a little more oomph to your backyard flyer) all the way up to the big 650-10 that would be right at home in a high-performance 2-meter sailplane or aerobatic model. Weights range from 96 to 249 grams, with outputs from 120 to 280 watts. Best of all, the rated efficiency of each motor falls between 76 and 81 percent; those are excellent numbers for brushed motors and will help maximize power and battery life.



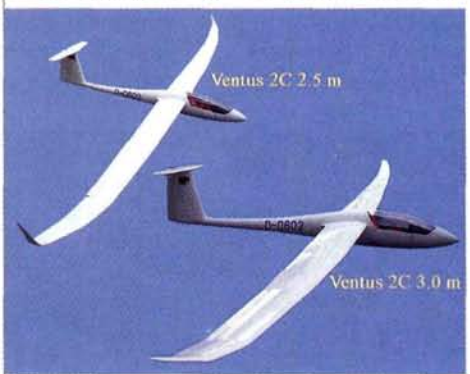
To get the most from your electric airplane, you'll need a topnotch ESC. In addition to the BEC-equipped units we featured in the April issue, LRP carries a pair of ultra-high-performance OPTO ESCs: the 58A and 80A. As the names suggest, they are rated for 58 and 80A constant current, respectively (peak ratings are 160 and 200A!). Each can support 7 to 18 cells, and they measure just 26x41x7mm. For more details on all of LRP's e-flight equipment, check out the website.

LRP Electronic; lrpelectronic.de.

ICARE

VENTUS 2C 2.5 AND 3-METER GLIDERS

Both of these scale beauties are replicas of the Shempp-Hirth line of high-performance gliders. Designed around the sleek fuselages of the Discus 2B frame, the Ventus 2C comes in two wing platforms. The 2.5-meter sports a three-polyhedral-break wing with high aspect, drag reducing winglets. The kit parts come finished with sheeted foam and Oracover-covered wings. The 3-meter version comes completely finished; its state-of-the-art hollow-core molded wing incorporates flaps, and optional retractable landing gear is available. Both models feature removable elevator and a detailed cockpit. Specs 2.5m/3m: wingspan—98/118 in.; wing area—442/465 sq. in.; weight—39/45 oz.; $319/$529.



ICARE Sailplanes (450) 449-9094; icare-rc.com.

TIPS & TRICKS

Illustrations by Richard Thompson

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

HANGING AROUND

Organizing airplane storage in small apartments and houses can be a big challenge. Here's a simple solution: head to your nearest home improvement center, and in the storage section, you'll find shelf uprights and brackets. At home, mount the uprights on an empty wall and space them to suit your models. Then, place the brackets at intervals that allow you to store the maximum number of models. To protect the models' finish from damage by the brackets, place a length of pipe insulation over the bracket. The beauty of this system is its versatility; you can quickly change the bracket spacing to accommodate any model.

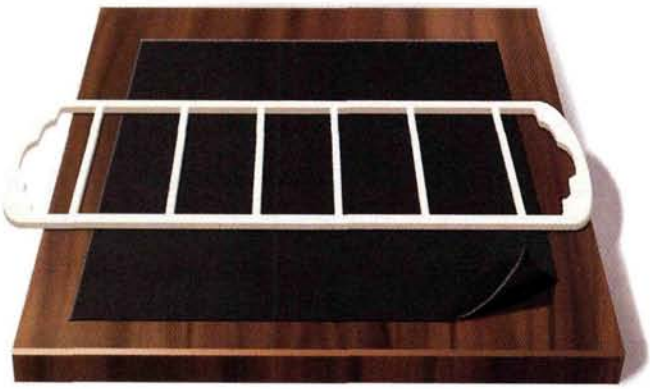
Mario Pavan, Nassau, Bahamas

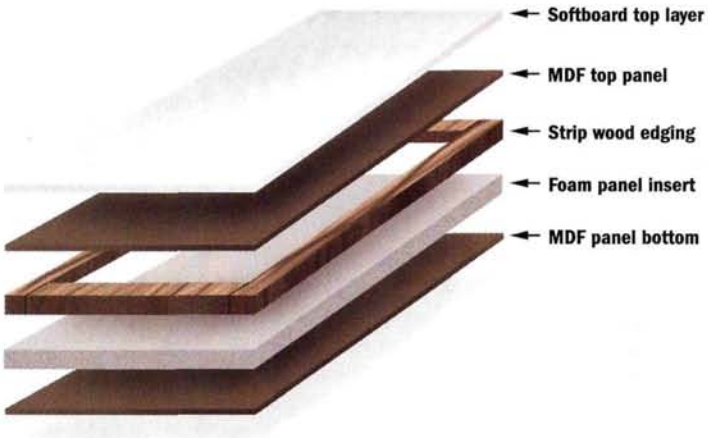


HELPING HAND

While sanding balsa parts, do you hold the parts in your hands or on your lap? If you've tried this, the parts probably slipped from your grasp. This isn't a very good method for precise sanding. Instead of holding parts with your hands, try this: find a flat board that's larger than a standard sheet of sandpaper. Use contact cement to glue a full sheet of 150- or 200-grit sandpaper to the board (grit side up). Then place the part you want to sand on the board; the sandpaper will firmly hold the part as you work on it. For convenience, make a large board that can hold both large and small parts.

F. Craig Mitchell, Mobile, AL



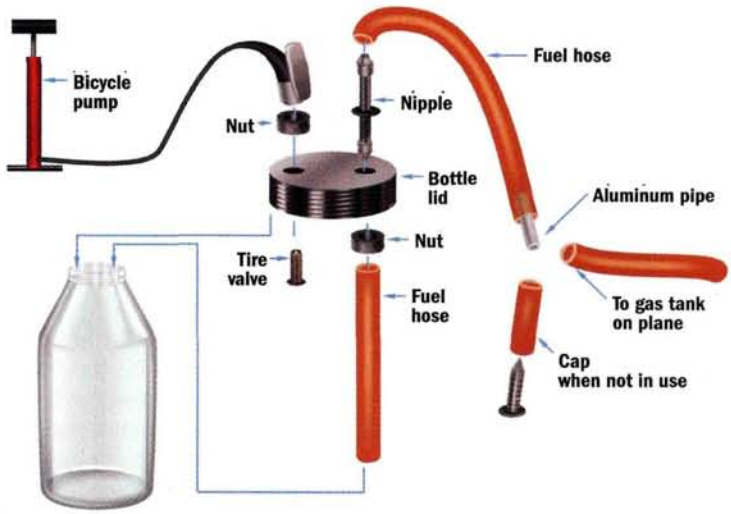


INEXPENSIVE BUILDING BOARD

All modelers need a flat surface to build on. Here are some tips on how to make your own building board that you can customize to any size from readily available materials:

- First, edge a piece of foam with a hardwood that's the same thickness as the foam; a ½- or ¾-inch square works well.
- Next, use PVA glue to add a top and bottom layer of medium-density fiberboard to the framework and weight it down until the glue dries.
- Last, add a top layer of Softboard to pin things to and a coat of paint to the bottom surface of the building board to keep it stable. A building board that is 5 feet long by 16 inches wide will accommodate all but the largest models.

Ken Horrill, Nelson, New Zealand



PUMP IT UP

If you're a diehard scratch-builder, here's a project you may enjoy: build your own simple fuel pump! Make sure that you use a fuel-appropriate container and add the parts as shown in the drawing. Tire valves are available at any tire service center. To fill your tank, add fuel to the container and attach the fill line to your model's tank. To pressurize the fuel container, use a bike pump and give it a couple of quick strokes. The air pressure will force the fuel out of the container, and the tank will promptly fill. As soon as it is full, push down on the tire valve to release the air pressure in the fuel container to stop the flow of fuel.

Pierpaolo Garofalo, Lanciano, Italy

PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

F-86 SABRE
Alisando Crecci
São Paulo, Brazil

When Alisando's dad finished building this great-looking BVM F-86 Sabre, he turned it over to his son, who came up with the stunning paint scheme. The Crecci team's fighter is powered by a Jet Cat 120 turbine engine with its power reduced to only 16 pounds of thrust. Alisando tells us that it flies great, and everyone who sees it simply loves it. No wonder; é magnífico!







STEARMAN PT-17
Raymond Kerner
Pacific Palisades, CA

As a cadet at the Olathe, KS, Naval Station in 1943, Raymond learned to fly the Stearman, and when he built this one from an old set of *Model Airplane News* plans, he painted it to look just like that full-size trainer. Though the plan was for a control-line model, he converted it to RC. It has a 48-inch wingspan, weighs a bit more than 6 pounds and gets its juice from an Enya 35 engine. Raymond added an authentic detail (see inset): the gosport, a flexible tube that permitted the flight instructor to talk to his student through a "cone"—a crude but efficient communication system. A mirror on the underside of the wing let the instructor see the student nod "yes" or shake his head "no" to indicate his comprehension (or lack thereof). Thank you, Raymond, for sharing this bit of aviation history.

FW-190 D9
Kevin Riecke Novato, CA

A two-year building project, Kevin's plane is modeled on an aircraft that served with the Luftwaffe unit known as JG26. It was shot down in the spring of 1944 during a dogfight with a pair of Mustangs. The model is powered by a YS .91 4-stroke engine with a Slimline Pitts muffler. It swings a 14x8 Graupner 3-blade prop with a Pica scale spinner and features Century Jet scale retracts that articulate at scale speed. It has flaps, but they aren't used because, according to Kevin, "... the bird lands like a feather. I ride the throttle a tad, then let her settle on in." Kevin used Model Master enamels to emulate the appropriate RLM (German State Ministry of Aviation) colors. He scratch-built the cowl, gun hood and cannon blisters out of fiberglass and resin, then finished the model with a custom scale cockpit and brass tube for the cannon. Says Kevin, "The plane draws much attention wherever I go with it ... it looks real on the ground and in the air. It flies very smoothly, has no bad habits, and the YS engine provides a 'supercharger whine' in flight. It's my favorite plane!"





FOUR-STAR
Ryan Livingston
Marshall, MI

Ryan wanted to build a plane with retracts that was both reliable and could handle even *his* landings, so he bought a Sig Four-Star 120 kit and converted it into a tricycle-gear arrangement with pneumatic retracts by B&D Enterprises. Other mods include a custom-made fiberglass cowl, a horizontally mounted O.S. .91 FX 2-stroke engine and a low-profile canopy. Ryan adds that Four-Star fanatics may notice the unusually tall fuselage forward of the canopy; it was extended in both the upward and downward directions to accommodate the nosewheel. Ryan's letter concludes, "It's a real presence in the air and on the ground."



PHAETON II

Dan Fiasconaro Hamden, CT

A fan of biplanes, Dan built this Phaeton II from a Balsa USA kit. It's powered by a 4-stroke Magnum .91 engine turning a 13x6 Zinger prop. Dan controls his 52-inch-wingspan bipe with a Hitec Flash 5 radio using dual rates for scale-like flying and aerobatics. He flies it with fellow club members of the East Coast Swampflyers out of North Branford, CT. Nice job, Dan.

TOMAHAWK

Don Lyons Dyer, TN

Don was inspired by Bob Violett's Bobcat and Tom Cook's Hustler twin-boom aircraft and his own desire to model a good-performing jet with off-the-shelf parts. He began with CAD drawings and then made molds for the fuselage and booms. The one-piece wing and the elevator are made of built-up balsa covered with MonoKote, and the fuselage is made of carbon fiber and Kevlar. The permanently attached booms are made of carbon fiber and standard fiberglass cloth. The Tomahawk's powerplant is an O.S. MAX 65 controlled by a Hitec radio. Don tells us that this is the third version of the Tomahawk that he has designed, built and flown; looks like the third time was a charm!



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EXTRA 300S

Jim Noppe Steamboat Springs, CO

This Great Planes .60-size Extra 300S is Jim's first kit-built plane. It has a 64-inch wingspan and 744 square inches of wing area, and it weighs 7½ pounds. Jim installed an O.S. .91 FX engine with a Brison Pitts muffler; the prop is an APC 14x6. His radio gear consists of a JR 8103 transmitter and R700 receiver with Airtronics servos. He says, "It flies very well and looks great! It needed very little trimming on the maiden flight. I have lots of fun flying it and hope to accumulate lots of hours with it."

SUPER SPORTSTER 40

Jeannette Giasson

Lavaltrie, Quebec, Canada

Jeannette writes that this Great Planes Super Sportster is her first plane, and even though it isn't a trainer, she's learning on it while she works on her next project. She adds, "The plane is well balanced and flies great!" She designed the flames and the fire engine theme to go with the pilot figure—a little fireman that she borrowed from one of her six kids.



Get Ready For The Ride Of Your Life!



In 1935, TWA added a New York City commuter flight carrying mail and passengers from downtown Manhatten to Floyd Bennett Field. According to the Chief Pilot, it was one of the most thrilling flights ever...under the 59th Street and George Washington bridges and around the island over to Eastern Long Island.

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Motors:	(3) Speed 280 (included)
Radio:	4 channel, 4 micro servos, 18 amp ESC
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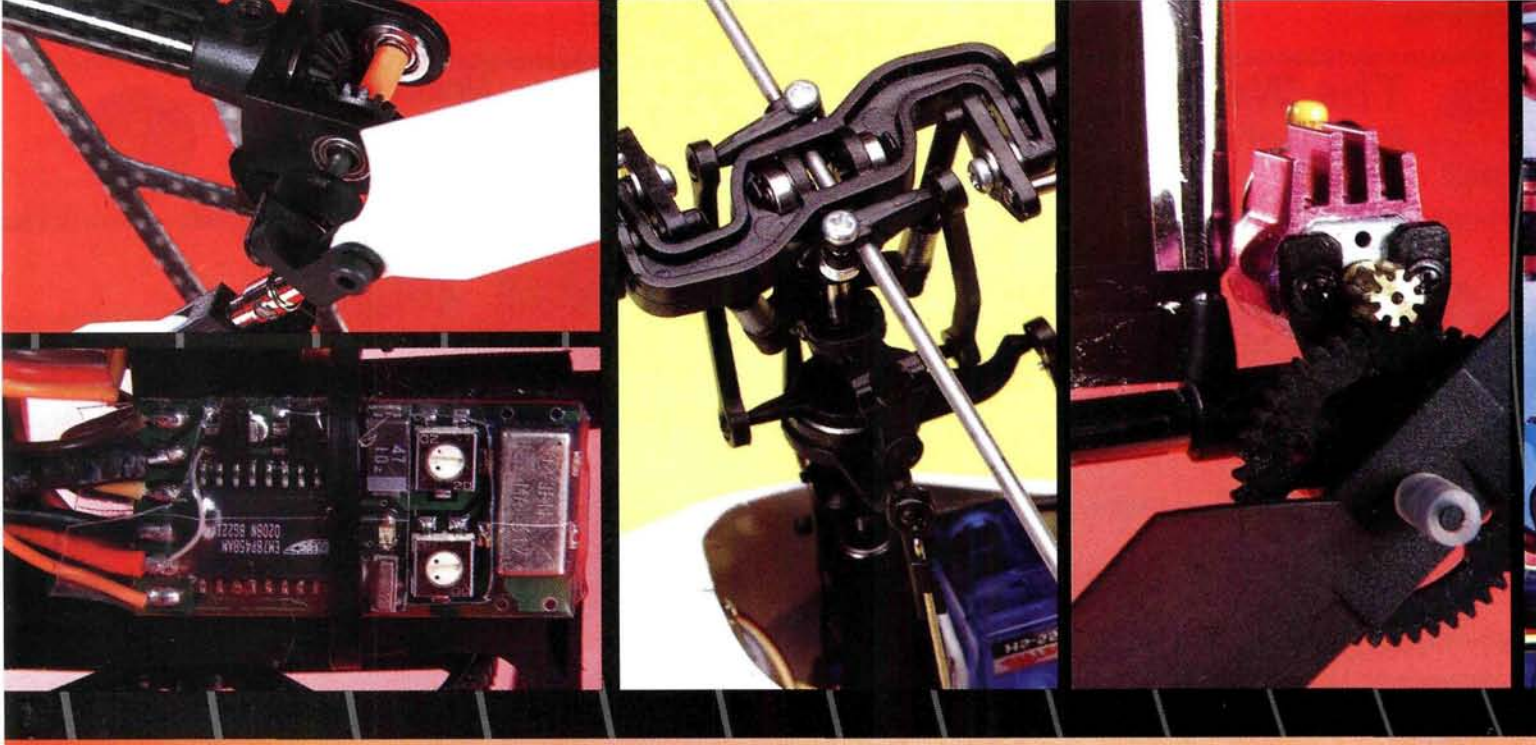
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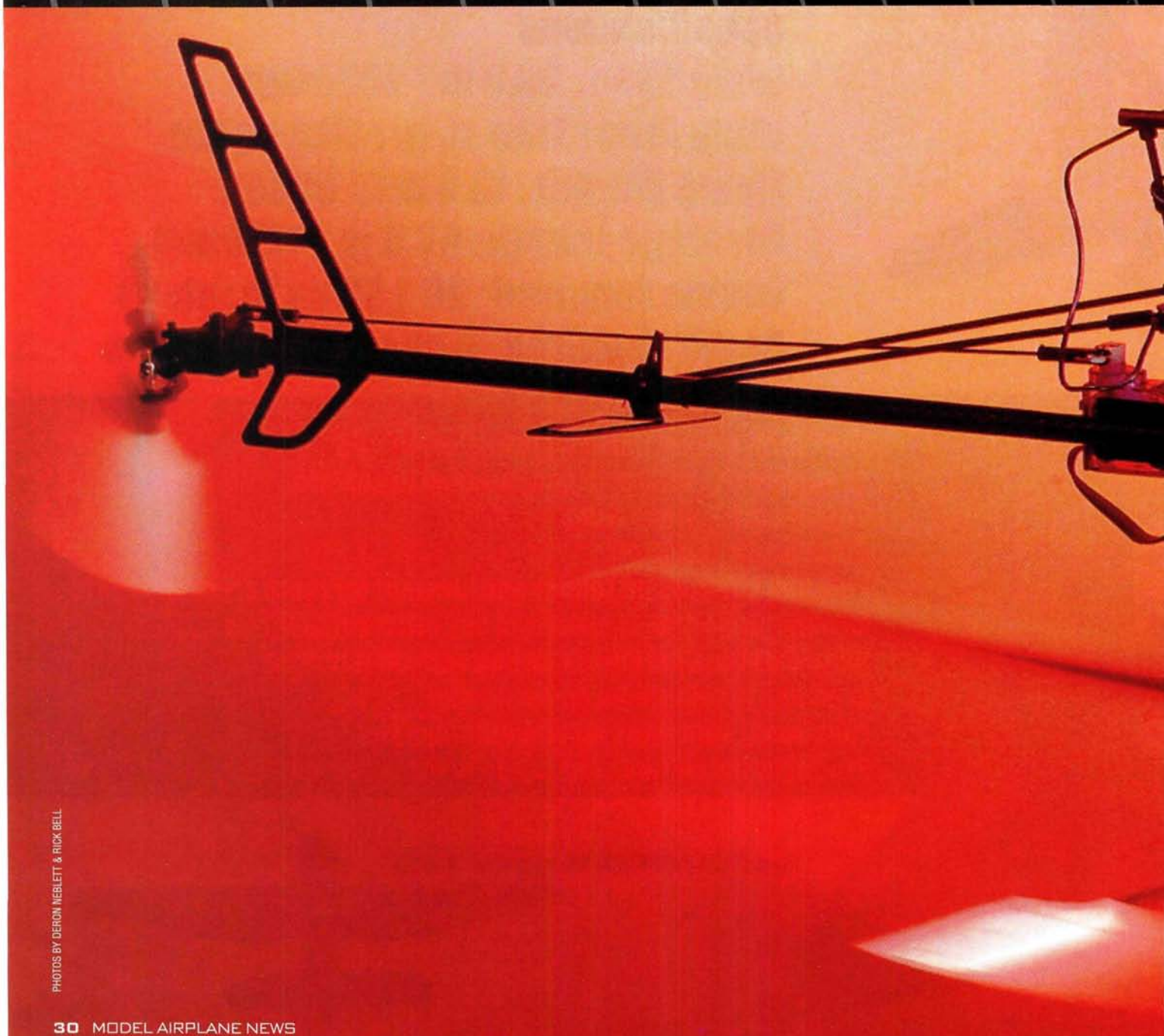
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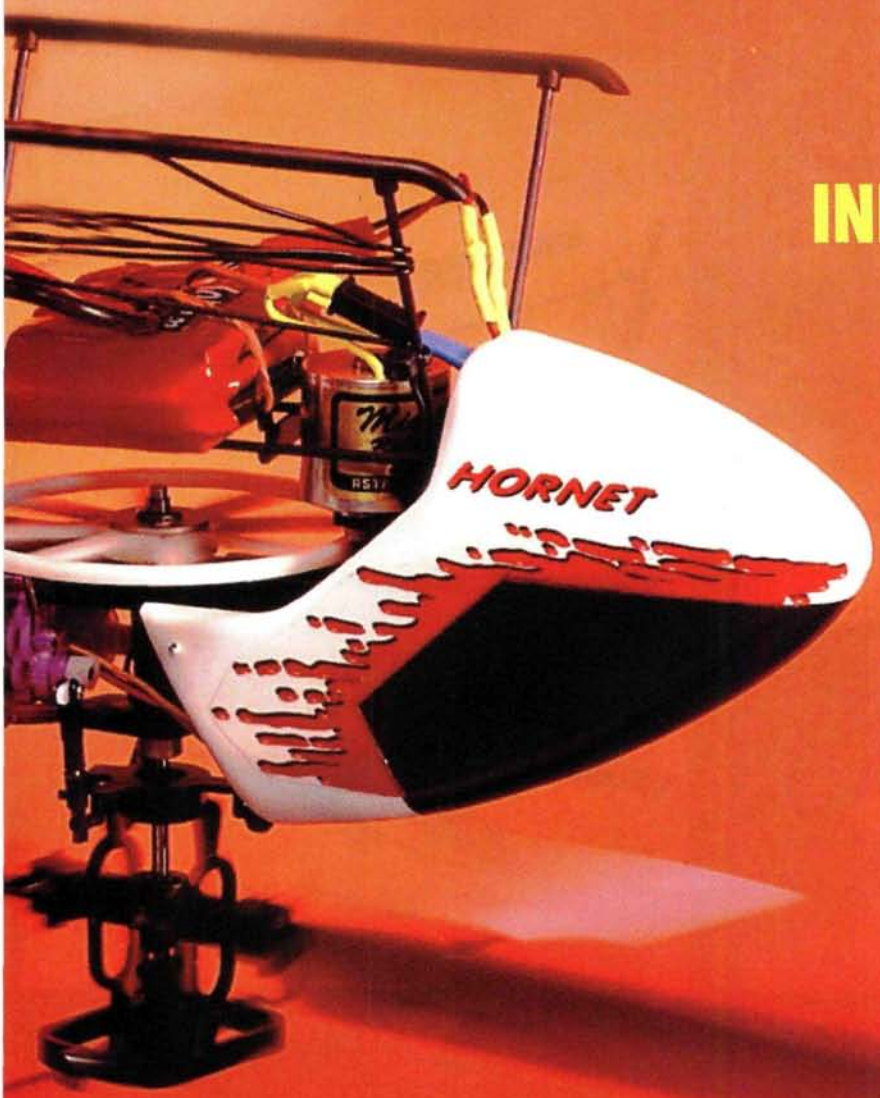


PHOTOS BY DERON NEBLETT & RICK BELL



micro heli MADNESS

by Rick Bell



JOIN THE QUIET INDOOR REVOLUTION

Micro helicopters are a fascinating aspect of the RC hobby; to me, they are the ultimate flying machines. It's absolutely exhilarating to fly a miniature helicopter in a living room, backyard, or local field without having to lug around the field equipment that's associated with larger glow-powered helicopters or worry about the noise they generate. Unlike the micro helis of a few years ago, today's current crop has the same flight characteristics as their larger brothers and are fully aerobatic and 3D capable. They can fly inverted, do loops, rolls, stall turns and autorotations.

Micro helis are also a great choice for someone who wants to learn to fly a helicopter without a big cash investment, and they are perfect for seasoned heli pilots looking for an impromptu flight when the opportunity presents itself. With the new developments in lithium batteries and brushless motors, we now see flight durations of more than 20 minutes—with power to spare. Sounds like fun, doesn't it?

HELICOPTER TYPES

Micro helis can be broken into two groups: fixed pitch and collective pitch. Fixed pitch means that the angle of the main blades is fixed; speeding up and slowing down the main rotor controls the heli's altitude. This type is less expensive and less complicated than a collective-pitch heli, and it uses a simple 4-channel radio. Most fixed-pitch micros use two motors: one for the main rotor and one for the tail rotor; the onboard electronics control both. The electronics include the receiver, 2 microservos and a piezo gyro. On some electronics, the gyro is integrated in the receiver. Because of its simple, mechanical nature and light weight, if you crash a fixed-pitch heli, it will typically survive with little or no damage. That quality is very much appreciated by inexperienced pilots.

To vary the altitude of a collective-pitch heli, you increase or decrease the angle of the main rotor blades; this feature is what allows the heli to perform exciting aerobatics. Because it's similar to a larger glow-powered heli in both mechanical layout and performance, you'll need to use a helicopter radio.

The heli type you choose will depend on your budget and which performance level interests you the most. If you just want to hover around in the living room or occasionally chase the cat, a fixed-pitch heli is the obvious choice, but if all-out performance is what you want, then a collective-pitch heli will keep you on your toes for a long time.

micro specs

MS COMPOSIT
Hornet II & Hornet CP-X

The Hornet II and Hornet CP-X are the newest members of the popular Hornet line from MS Composit. The Hornet II is a little larger than the basic Hornet and features a redesigned mainframe and landing gear for easier assembly, a sleek-looking canopy, factory-installed motor capacitor board and slick carbon-fiber main blades. Its size makes it more stable, so beginners will find it easier to fly. The Hornet CP-X is an all-out, 3D-capable heli right out of the box, and it comes with a new precision tail rotor, 3D flybar paddles, a carbon-fiber fin set and a 120-degree CCPM control system. Each of the MS Composit helis requires 4 microservos, a 10A ESC, a piezo gyro and a heli-capable transmitter.





AT A GLANCE
Rotor diameter Hornet II/Hornet CP-X: 560/490mm
Length Hornet II/Hornet CP-X: 680/600mm
Weight Hornet II/Hornet CP-X: 330/260g
Control system: 120-deg. CCPM
Price Hornet II/Hornet CP-X: $215.99/$209.99

IKARUS USA
Piccolo Fun & Piccolo Pro

The Piccolo is the heli that started the micro-heli revolution. The Piccolos are very affordable entries into the helicopter world. Like all micros, they can be flown in your home regardless of the weather, and they feature simple and robust construction. The Piccolo Fun uses 2 microservos and an electronic mixing board, and the Pro requires a third servo and a heli radio.





AT A GLANCE
Rotor diameter Fun/Pro: 500/540mm
Length: 500mm
Weight Fun/Pro: 280/335g
Control system Fun/Pro: fixed-pitch/collective-pitch
Price: $99.80 to $499

CENTURY HELICOPTER PRODUCTS
Hummingbird V2

Century has recently released the V2 version of its popular Hummingbird. The heli is now lighter and stronger than the original, and it has a new-style canopy. It comes with a high-performance 370 motor and balanced main rotor blades. Several versions of the Hummingbird are available; choose from just the heli, to complete packages that include radio systems. For all you scale buffs, Century has four scale fuselages that come finished and ready to go.



AT A GLANCE
Rotor diameter: 508mm
Length: 485mm
Weight: 290g
Control system: fixed-pitch
Price: $79.95 to $369.95

HOBBY LOBBY
Aero Hawk

The Aero Hawk comes in three versions: a Hughes 500 (civilian and military) and pod-and-boom. All are complete, ready-to-fly and come with the transmitter, a gyro, a mixing board, a speed control, battery and charger. The main and tail rotor blades are fixed pitch and controlled by individual motors; the mixing board contains two speed controls and handles both rotors. Through a BEC, the flight battery powers the receiver, servos and motors.



AT A GLANCE
Rotor diameter: 533mm
Length: 432mm
Weight: 283g
Control system: fixed-pitch
Price: $199 to $229

EXCEL HOBBY
Cupid

The Cupid comes 100-percent ready-to-fly with a painted body; just add batteries to the transmitter, charge the flight pack, and you'll be good to go. The package includes the helicopter, motors, a receiver, an electronic mixing board, a gyro and a 4-channel transmitter. Rugged and light, the Cupid can withstand a lot of punishment thanks to its tough ABS plastic and carbon-fiber construction. A factory-painted Hughes 500 body is available.



AT A GLANCE
Rotor diameter: 527mm
Length: 451mm
Weight: 270g
Control system: fixed-pitch
Price: $299.99

HOBBY SOURCE
XR-1

The new kid on the micro block is the XR-1, and it's loaded with features. It's easy to assemble and is flight-ready in minutes. The lightweight, damage-resistant body gives you the feel of what it's like to fly a real chopper. Its most unique feature is the Hover Vortex Gyro (HVG) technology; Hobby Source claims that it creates the most stable hovering of any 4-channel heli. The heli comes as a complete package that includes everything you'll need (except 8 AA batteries for the transmitter) to get airborne. If you break any parts, spares are readily available.



AT A GLANCE
Rotor diameter: 533mm
Length: 432mm
Weight: 283g
Control system: fixed-pitch
Price: $299.95

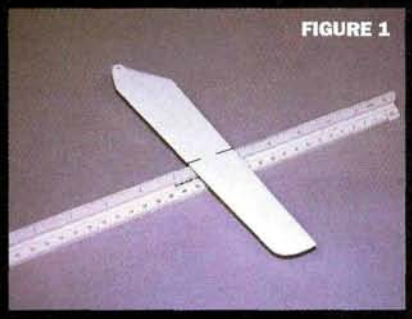
Balancing act

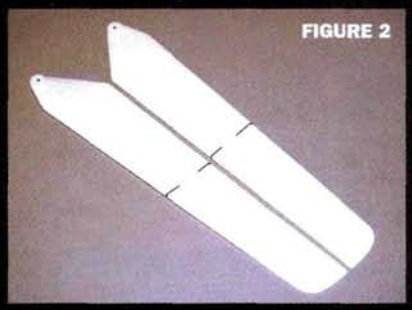
A critical part of building and setting up every heli is to balance the main and tail blades to prevent harmful vibration. The blades must have the same overall weight and the same center of gravity (CG). Although it isn't difficult to balance blades, it does take some effort to do it correctly. If the blades are balanced properly, most, if not all, vibration should be eliminated. To get started, you'll need a few basic tools: a triangle ruler, a precision balancer (such a Robart High Point), trim tape and a felt-tip marker. A gram scale is also very useful but not necessary.

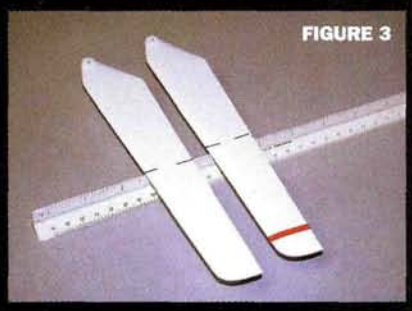
Start by finding the CG of the main blades. To do this, place a blade on the ruler until it balances, and then make a mark on the trailing and leading edges of the blade with the marker (see Fig. 1). Make sure that the blade is perpendicular to the ruler. Now, do the same for the other blade and compare the two (Fig. 2). Note the location of the CG marks; the blade with the CG closest to the blade's root must have the CG moved toward the tip. Use a small piece of trim tape and rebalance the blade until the CGs match (Fig. 3). The tape can also double as the tracking tape. The overall weight of both blades will be brought to balance by adding trim tape to the CG of the lighter blade later, so leave the CG marks on the blades. This is where the tape will be added during the final balancing of the entire head assembly.

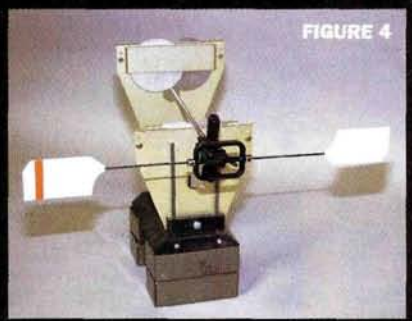
Next, the rotor head is static balanced in two stages on the high-point balancer. Balance the flybar and paddle assembly first, and then again with the blades attached. Use the main shaft to support the head assembly. If the shaft is too short for the balancer, substitute a longer length of steel rod that's the same diameter as the shaft. The head assembly is on the balancer, and the flybar and paddle assembly are unbalanced; the heavier side will hang low. Add tape to the light paddle until the flybar maintains a horizontal position (Fig. 4). Now attach the main blades to the head and use the same steps to balance them, except this time, add the tape on the CG mark of the light blade. When the rotor head is properly balanced, it should hold any position on the balancer without moving (Fig. 5).

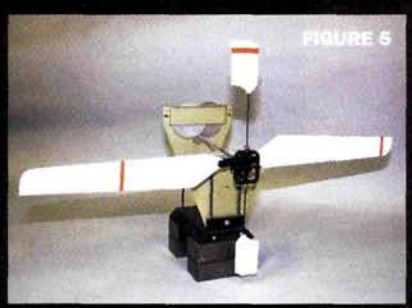
The tail rotor blades should also be balanced; remember, they spin a lot faster than the main blades. Use a metal rod that's the same diameter as the tail-rotor output shaft and balance the blades on the balancer. Add tape to the light blade until it hangs level. A properly balanced heli will not only perform better, but it will also encounter less wear and tear from vibration and will have increased flight times!


FIGURE 1


FIGURE 2


FIGURE 3


FIGURE 4


FIGURE 5

Brushless motors

The typical motor that comes with a micro heli is a Speed 300 (or similar size) brushed can motor. Although these perform very well, they need to be broken in correctly for peak performance. Brushed motors also require periodic maintenance; the brushes will eventually wear out, and that affects performance. The biggest advantage of a brushed motor is its low replacement cost.

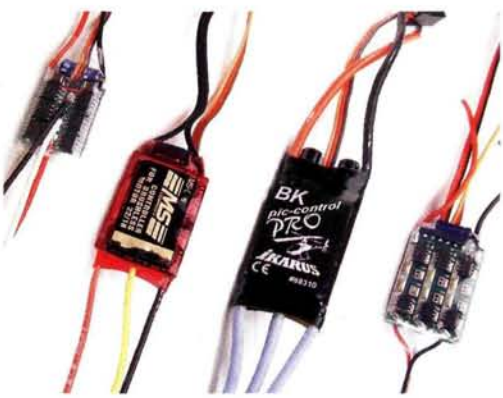


A brushless motor can really boost the performance of a micro heli. Hacker, MS Composit, Ikarus and AstroFlight brushless motors are lighter and more powerful than brushed motors.

For all-out performance, though, you can't beat a high-quality brushless motor. It doesn't require break-in, and its power output is greater than a brushed motor's. Another benefit is that its performance will remain very consistent over time.

A brushless setup (with a matching ESC) will set you back a minimum of $130. Some of the more popular brushless motors used in micros are available from Hacker, AstroFlight, MS Composit and Ikarus. These companies can also supply the required brushless ESC, as a "normal" brushed ESC isn't compatible with a brushless motor. Castle Creations Phoenix 10 brushless motor ESC is very popular with the micro crowd because of its micro-heli related features. Being able to disable the brake, set low cut-off voltage points, fix throttle endpoints and set a constant rotor speed via a governor from an all-in-one ESC are great conveniences.

If you decide to swap out your brushed motor for a brushless, check with the manufacturer of the heli or with a hobby shop that specializes in micro helis. It's likely that you'll have to change the pinion gear to get increased performance from the motor.



Brushless motors require brushless-compatible ESCs, and most have heli-related programming features. Castle Creations, MS Composit and Ikarus offer brushless ESCs that are very popular.

Battery Breakthrough

Battery technology is advancing at a phenomenal rate, and the latest batch of lithium-polymer (Li-poly) batteries has greatly enhanced the performance of micro helis. These batteries weigh very little, have a very high energy density and their discharge rate is quickly catching up to Ni-Cds and NiMH batteries. Two Li-poly cells wired in series (7.4 volts) is the most common combination for a brushed motor, and 3 cells in series (11.1 volts) is popular for brushless motors; both combinations will provide 15 to 20 minutes of flight time per charge. You could use an 11.1V pack on a brushed motor, but only at the risk of wearing it out prematurely.

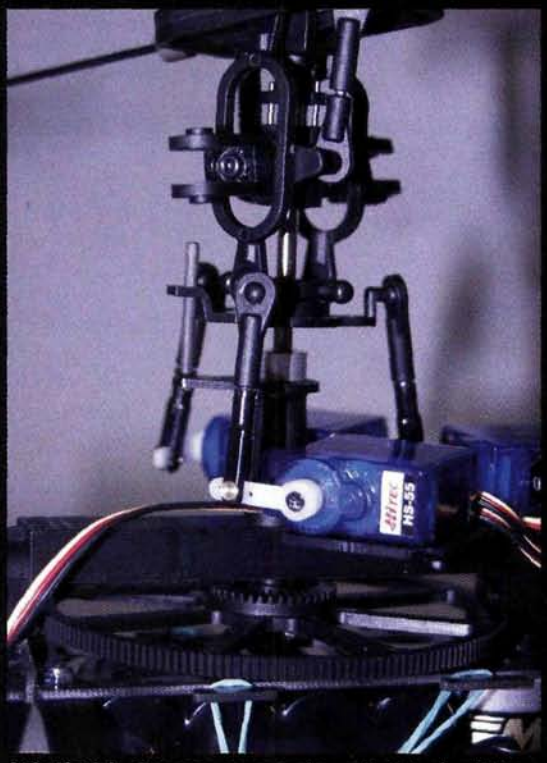
Li-poly batteries require a very different charging method when compared with NiMH or Ni-Cds, and it's necessary to use a Li-poly-specific charger; this can't be emphasized enough. If you use the wrong charger type, the cells can burst—with catastrophic results! Here are some safe-handling tips for Li-poly batteries.

- Only use a charger that's approved for lithium batteries.
- Make certain that you know how to operate the charger and that it's set correctly for the battery being charged.
- Never leave charging batteries unattended.
- Charge the batteries on a fireproof surface. If there is a problem, any damage will be contained.
- Do not charge a Li-poly battery at more than 1C of its rated capacity. For example, a 1200mAh battery should be charged at no more than 1.2 amps.
- If a cell expands while being charged, immediately remove it from the charger.
- This is very important: If you crash your model with Li-poly cells onboard, or if you drop them, the cells may be damaged internally. Remove the battery from the model and watch it carefully for at least 30 minutes to make sure it hasn't shorted out internally.
- Never use water to extinguish a lithium fire. Use sand or other means to smother any flames.



Lithium-polymer batteries are very powerful, weigh very little and are available from many sources. Taisun, Kokam, Hobby Source and Thunder Power are just a few of the sources for Li-poly batteries.

Collective-Pitch Setup Tips



At half stick, the servo arms and swashplate should be level with each other and in the middle of their travel.

Setting up a collective-pitch micro heli can be a little tricky, so here's a quick rundown of how to set up a Hornet (one of the more popular models).

Disengage the motor from the main gear or disconnect it from the ESC and center the trim levers on the transmitter. If your radio has subtrims, set them at zero. Reset the pitch curve to factory settings of 0, 25, 50, 75 and 100 percent and select the 120-degree CCPM swashplate mode.

Move the throttle/collective stick to the middle of its travel. Place the servo arms on the servos as close to 90 degrees (horizontal) as possible. Use the radio's subtrim feature to center the arms exactly in the center. Install the servo to swashplate pushrods after making sure they are all exactly the same length. Now, make sure that the stabilizer bed is positioned approximately in the middle of the guide pins. If it isn't, equally adjust the length of all three pushrods from the servos to the swashplate. The swashplate must be level. Now, move the throttle/collective stick to its maximum travel and note the position of the stabilizer bed as it moves up; it must remain engaged on the pins. If there is too much travel, adjust the pitch travel in the transmitter. Move the stick to its lowest setting. The stabilizer bed shouldn't bottom out; if it does, adjust as necessary.

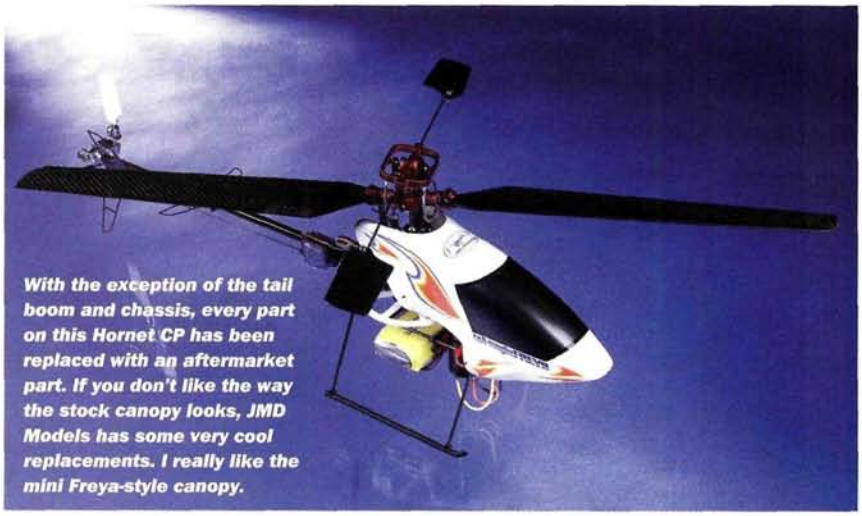
Now, adjust the length of the pushrods that are connected to the blade grips so that the main blades are as close as possible to zero degree pitch when the throttle/collective stick is in the middle of its travel. You'll make the rest of the pitch settings in the transmitter.

To get your heli airborne, here are some collective and throttle curve settings that "look about right." Tweak the settings to suit your flying style and proficiency level.

- Normal pitch: 0, 25, 50, 75 and 100 percent
- Normal throttle: 0, 35, 80, 90 and 100 percent
- Idle-up pitch: 0, 25, 50, 75 and 100 percent
- Idle-up throttle: 100, 100, 100, 100 and 100 percent

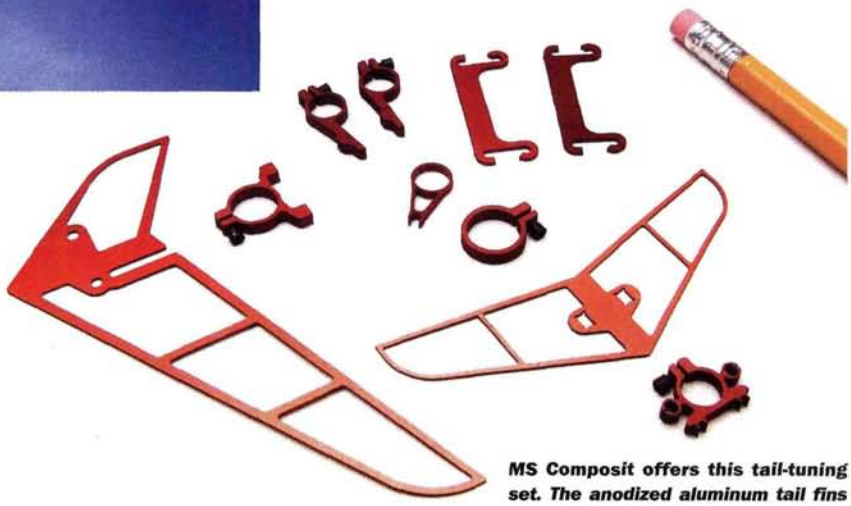
The best advice is to find an experienced heli pilot who can help you through the setup, flight trimming and early flight lessons. It will make learning a lot easier and less costly.

performance parts



With the exception of the tail boom and chassis, every part on this Hornet CP has been replaced with an aftermarket part. If you don't like the way the stock canopy looks, JMD Models has some very cool replacements. I really like the mini Freya-style canopy.

Not happy about the way a part on your heli looks or the way it performs? Have you broken a part and need to replace it? Well, after surfing the Web, I was absolutely amazed at the number of aftermarket parts that are available for micro helis. Almost every stock part on just about every micro heli on the market can be replaced; there isn't anything on a micro that can't be changed. Here's a look at a Hornet CP and a Piccolo Pro with aftermarket parts installed from nose to tail that include: main rotor heads, rotor blades and swashplates from Helihobby.com, Precision Model Products, JMD Models, MS Composit and Dee Tee Enterprises.



MS Composit offers this tail-tuning set. The anodized aluminum tail fins are photo-etched; they are direct bolt-on replacements for the Hornets.



Left: parts from Precision Model Products not only look great, but they also add performance. Its Piccolo rotor head, blade grips and swashplate make the Piccolo Pro rock!



If you like metal parts, take a close look at this setup. Helihobby.com offers a complete main rotor head for the Hornet heli. Performance to the max!

Dee Tee Enterprises has lots of great micro heli stuff. Check out this swashplate and the all-metal tail rotor gearbox.



micro product index

The products in this article can be broken down into three categories: micro helicopter manufacturers and electronics and aftermarket parts suppliers and distributors. Here's a list of our favorites.

Micro helicopters

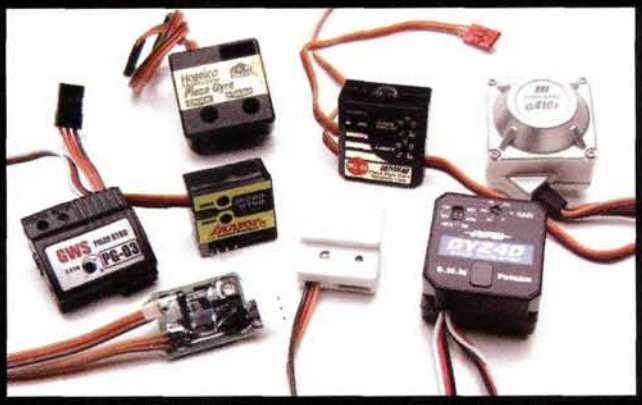
Century Helicopter Products (800) 686-8588; centuryheli.com.
Excel Hobby (516) 728-2883; excelhobby.com.
Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.
Hobby Source (949) 425-1362; hobbyclub.com.
Ikarus USA (239) 690-0003; ikarus.net.
MS Composit USA (650)-592-8592; mscomposit-usa.com.

Electronics

AstroFlight Inc. (310) 821-6242; astroflight.com.
Castle Creations (785) 883-4519; castlecreations.com.
Cirrus; distributed by Global Hobby Distributors (800) 854-8471; globalhobby.com.
GWS gws.com.tw.
Hacker (480) 726-7519; hackerbrushless.com.
Hitec RCD (858) 748-6948; hitecrcd.com.
Ikarus USA (239) 690-0003; ikarus.net.
JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.
Kokam; distributed by FMA Direct (800) 343-2934; fmadirect.com.
Taisun (407)-359-1020; taisun.com.
Thunder Power; distributed by Horizon Hobby Inc.

Aftermarket parts

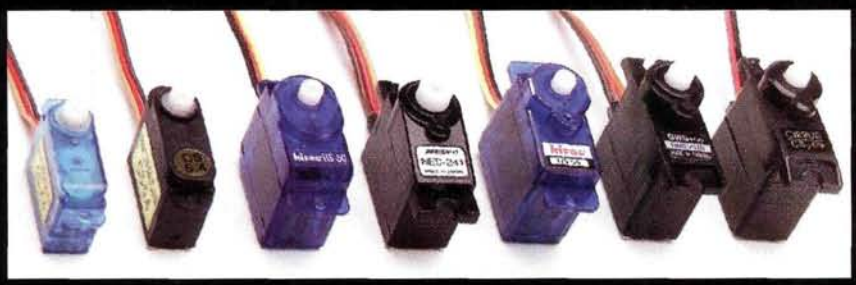
Dee Tee Enterprises (503) 692-6953; deeteeenterprises.com.
HeliHobby helihobby.com.
JMD Models jmdmodels.com.
Precision Model Products precisionmodelproducts.com.



Piezo gyros come in many shapes and sizes. Manufacturers such as Futaba, JR, GWS, Hobbico, Century and Ikarus have gyros that suit any budget.



Just about any part on a micro heli can be replaced with a comparable aftermarket part. Precision Model Products offerings include swashplates and rotor heads. They sure look sharp!



Need a servo? As you can see, there are many microservos to choose from. Hitec, Cirrus, JR and GWS have the muscle you need.

microflight pioneer

The growing world of micro helicopters wouldn't be possible without the creative genius of people like Alexander Van de Rostyne; he's the designer of the successful Ikarus Piccolo. Van de Rostyne built his first micro helicopter in 1997; six years and 20 prototypes later, his just-released sub-micro Pixelito has 4-channel control, yet only weighs 6.9 grams—almost 20 times lighter than his first micro heli! Even more amazing, it doesn't have a swashplate or servos; instead, it's controlled by a tiny Didel receiver that picks up an infrared beam transmitted by a modified Futaba radio. A 45mAh Lithium-polymer cell provides the power.

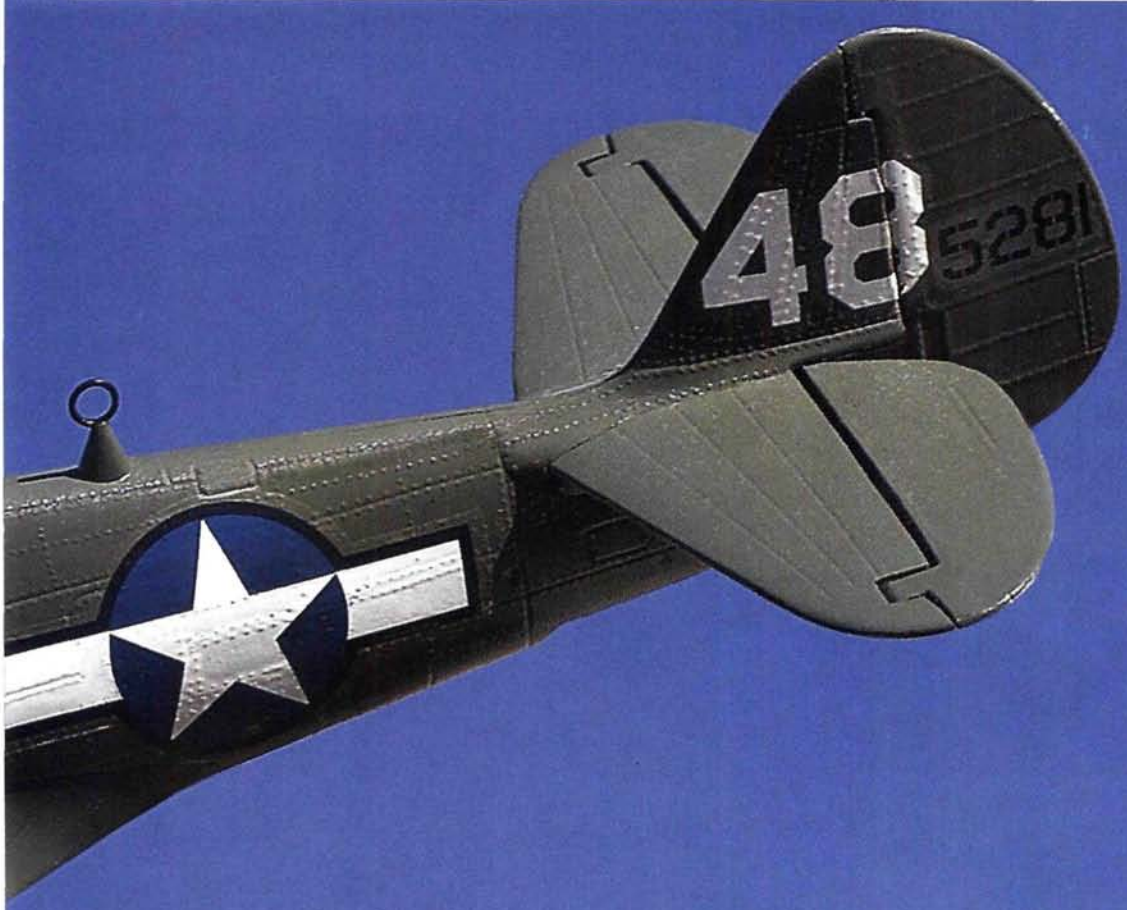
What's next for this ultra-micro designer? Van de Rostyne writes, "I must admit that the race for making smaller and smaller [helicopters] is starting to hit a barrier. One day it will become very difficult for even the most skilled modeler to cope. The biggest challenge in building the Pixelito was the size of its parts. Manipulating, gluing, adjusting and even just seeing them can be a problem. The funny thing is that it was relatively easy to make the Pixelito compared with the effort required to make the first Pixels. The main reasons for this are the progress in battery technology, the availability of micro motors and the flood of micro electronics that have become available to us."



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MODELAIRPLANENEWS.COM



WW II legend for the schoolyard



HOBBY LOBBY P-40 WARHAWK

by Martin Robinson

When I think of WW II fighter planes, two come to mind: one is the P-51 Mustang, of course, and the other is the Curtiss P-40 Warhawk. The P-40 was probably better known as the "Tigershark" because many sported the well-known shark's-mouth art around the air inlet at the front of the plane—especially those that belonged to the famous Flying Tigers. The Flying Tigers were a group of volunteer American pilots who defended China from the Japanese before the U.S. entered WW II. They painted the sharks' mouths on their P-40s as their insignia, hence the name Tigershark. Distributed by Hobby Lobby, the Flying Styro P-40 came with two sets of decals; a Skull insignia scheme and the signature Tigershark scheme. I chose the shark's mouth, of course!

PHOTOS BY JOHN REID & MARTIN ROBINSON



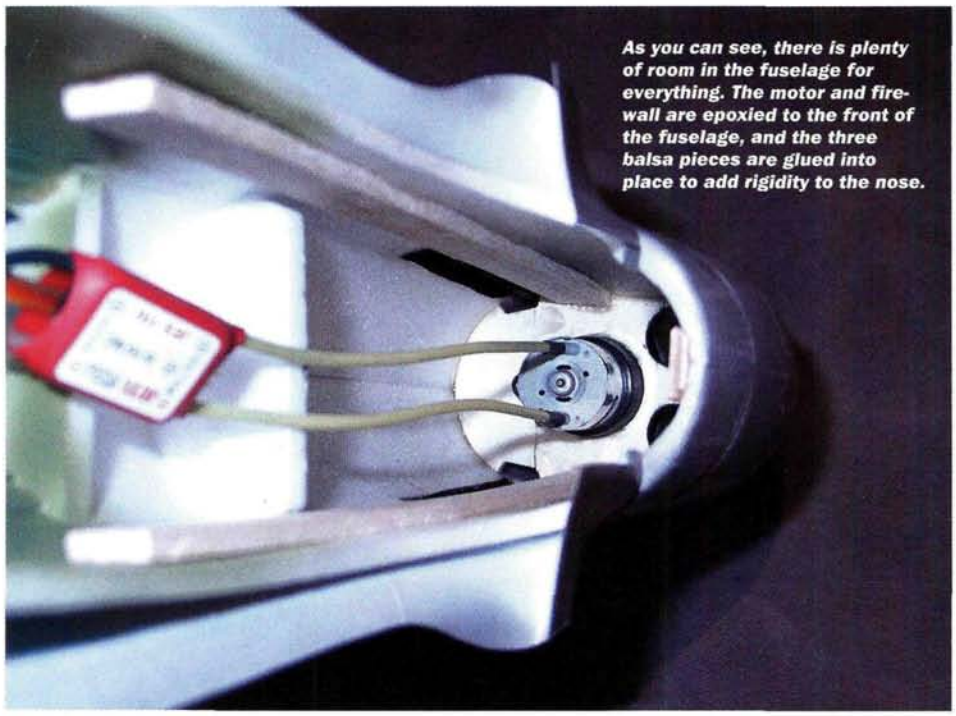
OPENING THE BOX

At first glance, it was evident that much thought went into the plane's scale details. The fuselage, wings and tail feathers are all made of hollow lightweight foam with panel lines, rivets and other details molded right in and painted dark green on top and gray underneath. After I had removed the main parts from the box, I looked over the hardware package and the many vacuum-formed, painted plastic parts. I knew this would not be a quick build, but the manufacturer did most of the detail work for me, and with the exception of the pilot figure, I didn't have to do any painting. Don't worry about chipping; touch-up paint is included.

ASSEMBLY

The manual contains illustrations of all the components and includes identification numbers. These numbers are referred to in the assembly illustrations to make parts identification easy. This model can be built from the illustrations alone, but the supporting text makes assembly a snap.

• **Fuselage.** I began fuselage construction by gluing a Graupner Speed 300 motor and a Griebel gearbox to the firewall. The



As you can see, there is plenty of room in the fuselage for everything. The motor and firewall are epoxied to the front of the fuselage, and the three balsa pieces are glued into place to add rigidity to the nose.

specifications

MODEL: Curtiss P-40 Warhawk

TYPE: electric scale WW II fighter

MANUFACTURER: Flying Styro

DISTRIBUTOR: Hobby Lobby Intl.

WINGSPAN: 31.9 in.

WING AREA: 181.4 sq. in.

LENGTH: 28 in.

READY-TO-FLY WEIGHT: 14.3 oz.

WING LOADING: 11.35 oz./sq. ft.

DRIVE SYSTEM REQ'D: geared Speed 300

DRIVE SYSTEM USED: Graupner Speed 300 with 7.7:1 Griebel gearbox and Jeti JES-08-3P ESC



RADIO SYSTEM REQ'D: 3-channel, micro-receiver, 2 sub-microservos

RADIO SYSTEM USED: Hitec Focus 3, Hitec Micro 555 receiver, 2 Hitec HS-55 sub-microservos



BATTERY USED: 8-cell, 700mAh NiMH

FLIGHT DURATION: 6 to 7 min.

PRICE: $129

FEATURES: painted, molded-foam fuselage, wings and tail; hinged and installed ailerons; painted, vacuum-formed spinner and scale trim; detailed cockpit; all hardware and decals included; optional nonfunctional landing gear and drop tanks included.

COMMENTS: this is an incredibly detailed kit of a famous WW II warbird. I appreciated that most of the parts were painted (only the pilot figure wasn't). The quality of the finish results in a very satisfying scale model that is perfect for display. It almost seems a shame to fly it.



flight performance

When I fly warbirds, I expect form over function with most kits. Most scale warbirds are designed to replicate the detail of the full-size plane, and their flight characteristics are secondary to their looks. This Warhawk, however, flies extremely well for a scale plane with such detail. This is because it was designed to have a low wing loading and plenty of power, and Flying Styro light construction techniques really pay off in the air.

TAKEOFF AND LANDING

The P-40 must be hand-launched into the wind with the wings level and the nose slightly up. If you have someone to give you a hand with the launching, take advantage of it, especially for the first few launches. I set the throttle to about ⅔ and gave it a strong, straight-and-level toss just slightly nose-up. It climbed out well, and once it had gained a little airspeed, I increased the throttle. I didn't launch under full throttle because the prop creates significant torque, and the ailerons don't have much authority at slow speeds to overcome it. When the plane reaches flying speed, this is not an issue. Trust me; this plane has more than enough power to be hand-launched at ⅔ throttle.

Landing could not be easier. I just backed off on the throttle and let the plane settle down until it was just a foot above the ground. Then I flared it and landed it in the grass on its belly. It doesn't have any bad stalling characteristics, and it almost came to a stop in the air before it landed—thanks again to that low wing loading. The undercarriage survived without so much as a scratch.

LOW-SPEED FLIGHT

The P-40 Warhawk flies well at about ½ throttle, and I did some low passes and gentle turns. Although the controls do get sluggish, the plane is very predictable. I didn't have any problems controlling it at slow speeds, and this gentle, slow-speed flight made lining up for a good landing very easy.

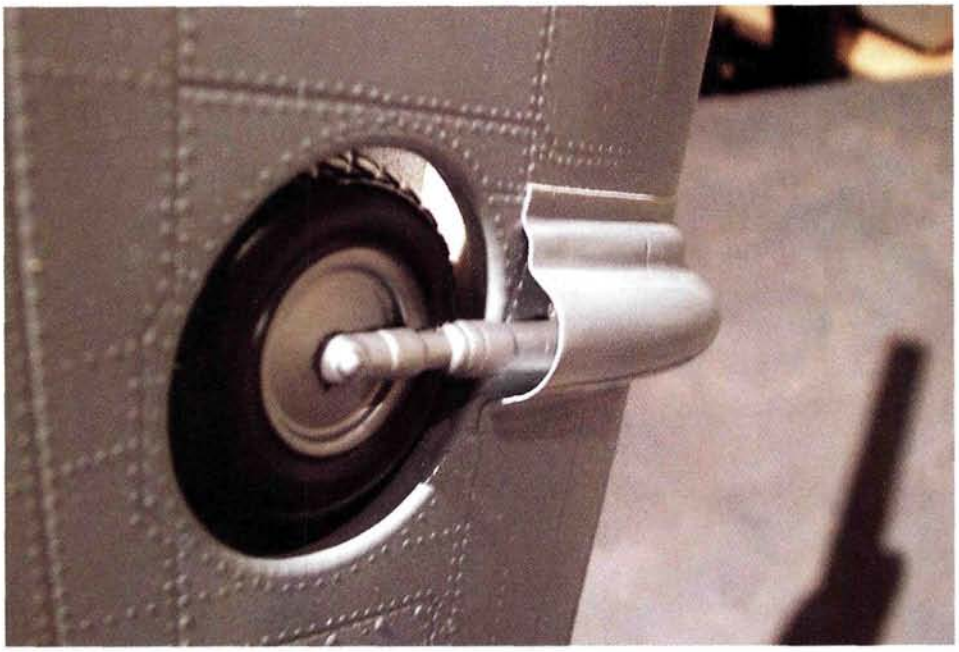
HIGH-SPEED PERFORMANCE

I would say ⅔ throttle gives the most realistic scale flight, and opening the throttle all the way allows great pull-outs from strafing runs. At full throttle, the plane really gets moving, and I felt comfortable enough to try basic aerobatics.

AEROBATICS

I was able to do most aerobatics that don't require a rudder. The P-40 tore up the sky with rolls, loops and even hammerheads. The rolls were not quite scale because they had a little snap at the end. I was pleasantly surprised by how well it flew inverted, but I don't think the real Warhawk flew inverted much. My favorite maneuver is a fast strafing run with a victory roll at the end.

I wish I had installed the optional rudder control. Though it wouldn't be impossible to install it now, it would have been much easier to do during construction. Right rudder is important to overcome torque from the prop and to help the tail track in turns, and you also need a rudder to do nice, scale barrel rolls and other aerobatics. Nevertheless, the Warhawk is a great flying plane in its stock configuration, and for most weekend flying, you'll have a ball with it.



Another example of this kit's fine detail: the wheels appear to be retracts, but they are permanently glued into this position for ease of flying. Also, note the nice panel lines and rivet detail.

I appreciated the kit's attention to scale detail. This is a display-quality warbird that you can actually fly.

firewall required a little work to get it to fit in the proper position. Once I had it installed correctly, I epoxied everything into place. This motor installation gives the plane a clean look, but it will make future modifications and maintenance difficult. To add rigidity to the nose, glue the three balsa stiffeners to the inside walls.

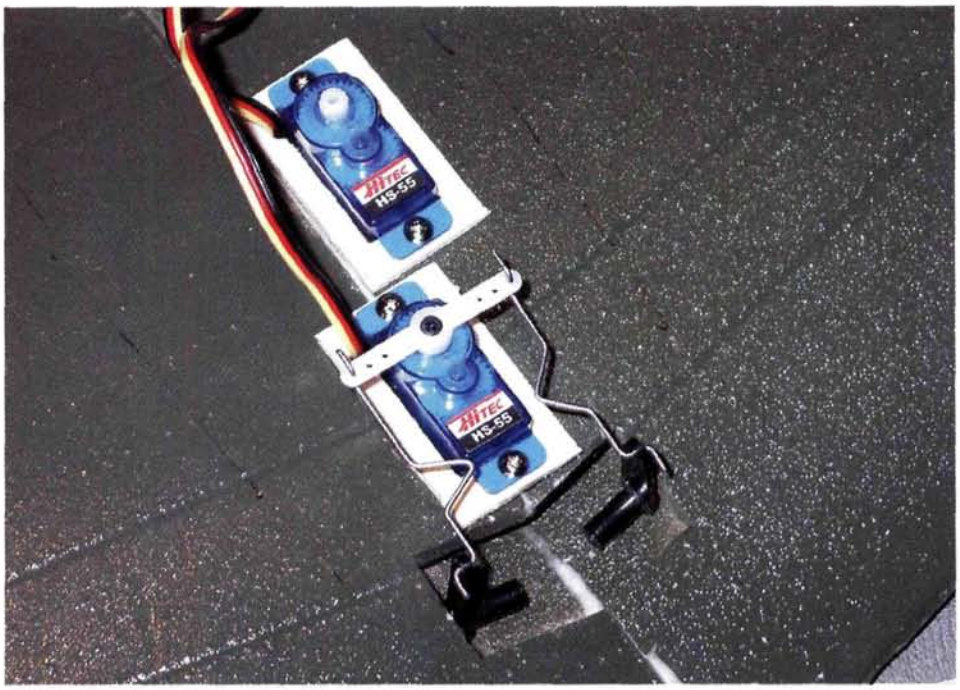
Next comes the installation of the exhaust details and the tail feathers. The manual's introduction says that the rudder can be modified to make it functional, but there are no specific directions for that. Rudder control improves a plane's turning ability and helps counter prop torque. I recommend that you take the time to make the rudder functional if you have the building knowledge to do so.

After attaching the tail, I connected the elevator pushrod; this was easy because the pushrod tube is already installed in the fuselage. I just slipped the wire through and glued on the control horn.

• **Wing.** Before I started to build the wing, I had to decide whether I wanted to add static landing gear. Although it's strictly a hand-launch plane, it came with landing gear for display purposes only (the gear can't be used for landing). Because I built the plane to fly it, I didn't care whether it rested on wheels on the shelf, but I liked having the option, and I am sure there are many who would want to display this great-looking kit. There were vacuum-formed wheels, struts and covers that I glued to the underside of the wing to give it the look of the scale gear-up configuration in flight. They look so real that spectators often exclaim, "Wow, you have retracts on that!" The instructions recommend that you use UHU Por glue on all of the vacuum-formed parts, but I used 5-minute epoxy, and it worked just fine. I fit the balsa spar and then joined the wing halves. The fuselage's molded-in fairing adds a nice finished look to the area between the fuse and the wing joint.

• **Radio gear and final assembly.** After I had glued the wing onto the fuselage, I finished installing the electronics. There's plenty of room for a micro-receiver and the recommended 8-cell, AAA battery pack; mount the pack right on the plane's center of gravity (CG). That position makes it easy to switch to lighter Li-poly batteries because it won't affect the CG—an important consideration.

I had two options for the cockpit: I could have a pilot or a detailed interior that includes rudder pedals and a seat. I chose the pilot, and this was the only time I had to break out the modeling paints. Because of the scale detail, it took time to paint the pilot, who has a molded-in mustache. While I had the paints out, I added details to the instrument panel. Now it was time to choose my decals; my decision to go with the shark's mouth configuration was a no-brainer. The decals are of the water-slide type that is generally found in plastic-model kits. They're easy to place and so thin that



Install the elevator and aileron servos in the top of the wing. After you've attached the wing to the fuselage, you hook the elevator servo up to the pushrod.

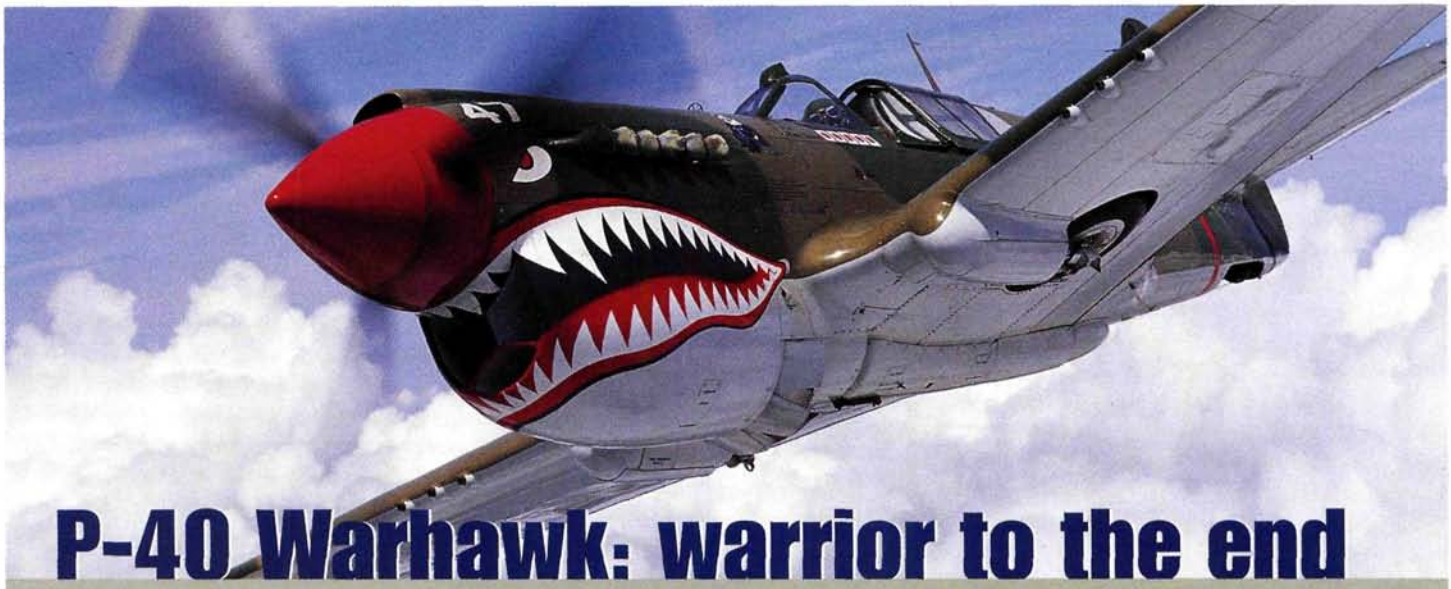
they look painted on. The teeth decal posed a problem because the plane's nose has compound curves, and the decals would not stick to it. I solved this problem by first pressing them onto the flat areas of the nose and letting them dry. Then I held the remaining part of the nose decal down with clear tape; this worked very well. The other decals stuck nicely to the fuselage and the wing. They look great because they have a satin finish that matches the paint and lets the panel rivets show through—an excellent way to top off a great-looking plane.

The quality of the finish results in a very satisfying scale model ...

FINAL THOUGHTS

I appreciated the kit's overall quality and Flying Styro's attention to scale detail. This is really a display-quality warbird that you can actually fly. I was able to build it in a few evenings, but if you plan to add the static landing gear and fuel tank, you will need more time. When you've finished, you will want to take plenty of pictures. Now it was time to head out to the park.

Flying Styro; *distributed by Hobby Lobby Intl.*
Graupner; *distributed by Hobby Lobby Intl.*
Hitec *(858) 748-6948; hitecrcd.com.*
Hobby Lobby Intl. *(615) 373-1444; hobby-lobby.com.*
Jeti; *distributed by Hobby Lobby Intl.*



P-40 Warhawk: warrior to the end

The P-40 Warhawk will never be enshrined in the "Fantastic Fighters Hall of Fame;" it was too slow, it couldn't turn tightly enough, it was hard to handle on the ground and, compared with some fighters, it had nasty stall characteristics. Further, its hydraulic system was too complicated, its landing gear too rudimentary and its Allison V-12 too anemic.

If the foregoing is all true, then why, when you get a bunch of WW II vets together who were in uniform on that December day in 1941, do they speak of the P-40 with such reverence? That's easy. They love the P-40 because "it was there." It was on line, it was flying, and it was available to carry on the fight, regardless of the odds.

An outgrowth of the round-motor P-36A, the P-40 wedded the new Allison V-12 to "one of them new-fangled monoplanes" at a time when biplane fighters were still flying for both the Army and the Navy. Later, pilots bemoaned the lack of the two-stage supercharger that gave the Mustang enough power for high-altitude operations, but mechanics much preferred the Allison to the British-designed Merlin because it was a joy to work on and had none of the "built like a watch" eccentricities of the Merlin. Like the airplane itself, what the Allison lacked in finesse it more than made up for in rugged dependability.

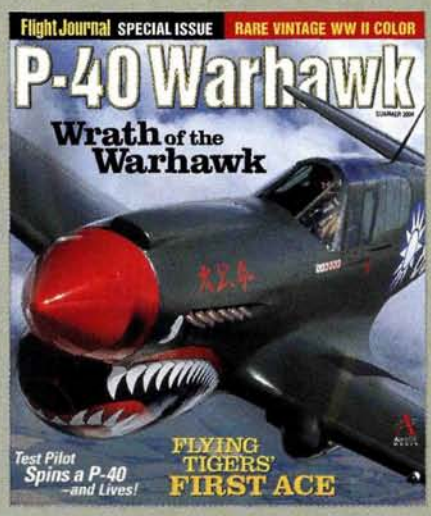
On the very first day of combat, the P-40s over Pearl made at least a few Japanese pilots sorry they had picked a fight that day. Mere hours later, P-40s over Clark Field in the Philippines did their best to hold back an enemy force of gargantuan size. The few bright lights in a very dark December came from the exploits of P-40 pilots, including those who went on to gain legendary status as the American Volunteer Group—the Flying Tigers.

The P-40 wasn't without its strong points. For one thing, it was hell for stout and could absorb a terrific amount of punishment and, as long as the coolant system was intact, bring its pilot home. If the pale haze of leaking glycol forecast imminent engine seizure, the hulking airframe did its best to protect its pilot in any airplane-versus-ground encounter.

The Warhawk could also dive as if it had invented gravity. When they had the altitude advantage, Warhawk pilots would fall on their prey like enraged cougars, slash through them unscathed and convert all that speed and energy into a high-speed zoom that put them back above their enemy again. The ability to dive coupled with the awesome firepower of six, .50-caliber Browning machine guns gave them a lifesaving option: dive into the fight when it looks good, and dive out of it when the tables are turned against you.

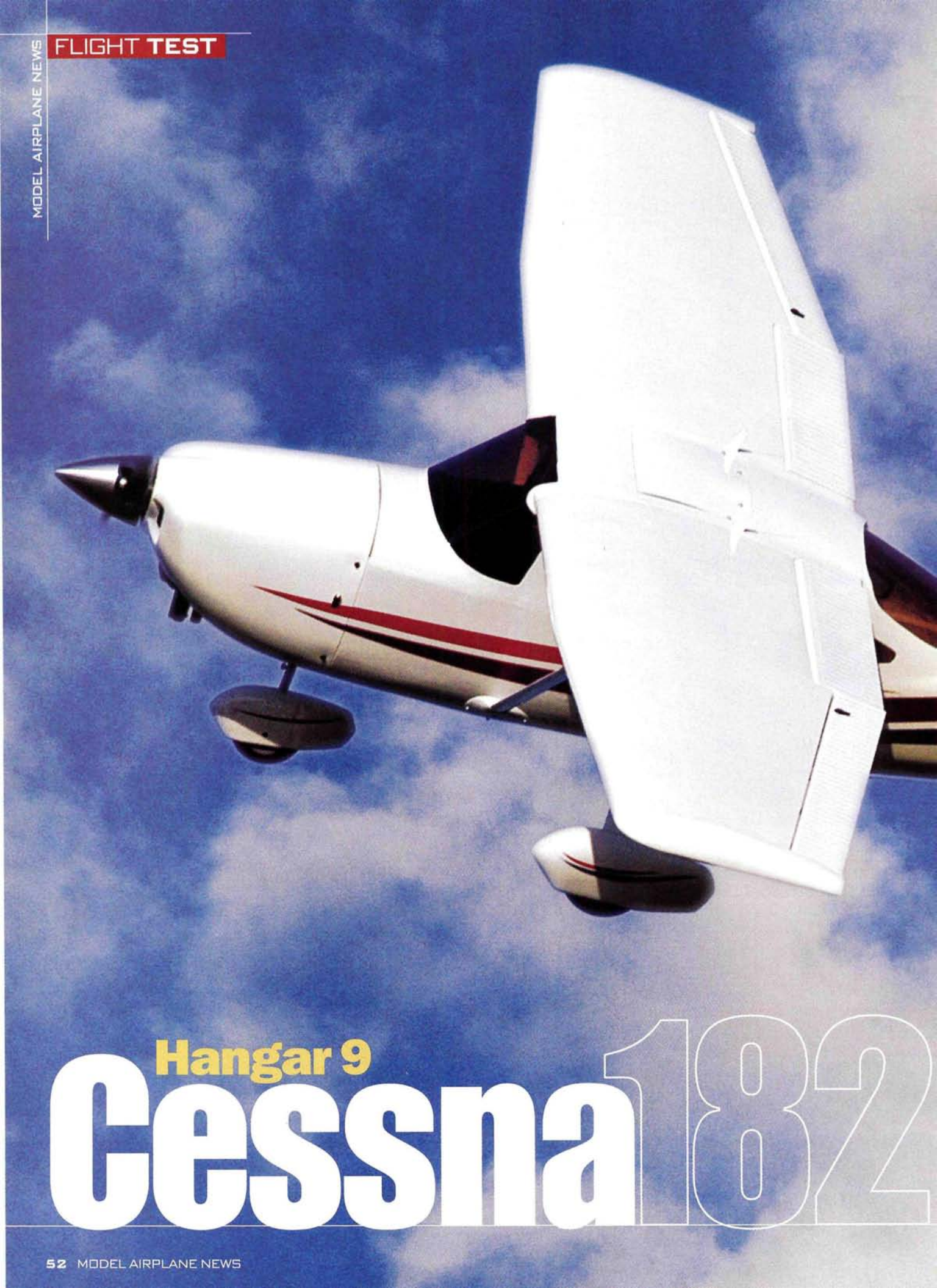
It's unfortunate that in the eyes of America, the P-40 will forever wear the shark's-mouth paint job of the AVG because the airplane was so much more than that. Most wore plain olive drab paint as if they were dressed in coveralls to go to work—and, in fact, they were. The P-40 was the hardworking journeyman fighter of WW II—always there, always doing what was asked of it.

—Budd Davisson



A dominant WW II U.S. fighter, the Curtiss P-40 Warhawk remains a favorite of warbird buffs and historians alike. With first-person accounts and vivid photos, this riveting special issue of our sister publication Flight Journal *brings to life the P-40's combat missions and the pilots who flew them.*

FLIGHTJOURNAL.COM



Hangar 9

Cessna 182

Gorgeous giant-scale gem

When Cessna introduced the first 182 Skylane in 1956, it set the standard for multipurpose, single-engine light airplanes. With its powerful engine, roomy cockpit and forgiving flight characteristics, the 182 has been a favorite among pilots for many years.

The Hangar 9 Cessna 182 ARF is an easy-to-assemble, detailed reproduction of this. The kit features built-up balsa and plywood construction, numerous scale details and a complete hardware package—truly a deluxe kit. Modeled after the 2000 Skylane, this IMAA-legal model is certain to please those who are looking for something a little different and want to impress their fellow aviators.



by Peter Abbe

Skylane

PHOTOS BY PETER ABBE AND CHERI SASSMAN



THE BASICS

The fuselage, wings and tail feathers are built up and fully sheeted with balsa. The elevator, ailerons and flap surfaces are finished with plastic corrugations. I contacted the folks at Hangar 9 when I noticed a small hole in the left flap, and they promptly sent me a new one.

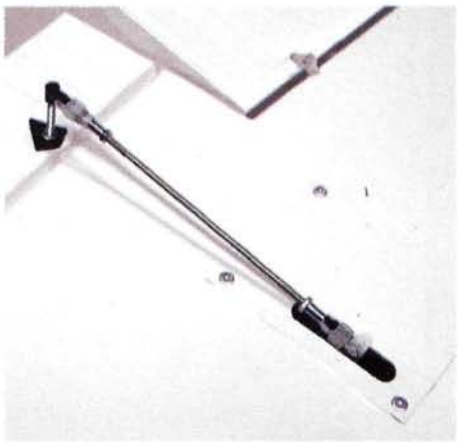
The cabin area comprises a molded-plastic piece glued to a balsa and plywood substructure. The plane comes with plastic, formed strut fairings, seats and windows and a fiberglass cowl, tail cone and wheel pants. The airframe is adorned with a scale trim scheme and is covered in white Ultracote. The instrument panel and Skylane markings are provided on a self-adhesive decal sheet.

The hardware package includes bolts, screws, CA hinges, hinge points, landing gear, control horns and linkages, a fuel tank and an engine mount—nearly everything you need to finish the airframe. An aluminum spar tube and airfoiled aluminum struts are provided for wing attachment. The 50-page instruction manual is one of the finest I have seen and features nearly 200 photos to clearly detail every step of assembly.

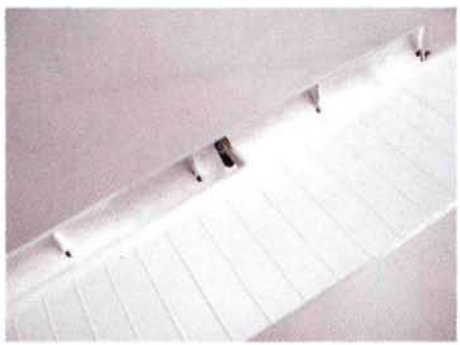
ASSEMBLING THE WING

To complete the wings, you must hinge the ailerons and flaps and install the servos and linkages. Using the supplied hinge points, attach the scale flaps; they're actuated by concealed linkages. CA hinges are provided for the ailerons. The aileron pushrods and control horns are the only exposed linkages on the model. I opted to replace the supplied nylon control horns with Du-Bro adjustable control horns because they're easier to install.

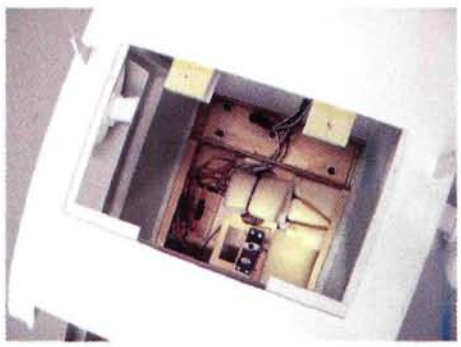
The servos are mounted on plywood hatches and neatly concealed in the wings. I had to remove a small portion of the mounting rails to achieve proper



Aileron servos are mounted on a plywood hatch; the linkages are short and tight.



Concealed flap linkages operate the flaps in a scale manner.



The receiver, battery pack and nosewheel servo are concealed beneath a plywood hatch in the fuselage. The cabin is accessed through a removable plastic hatch on the top of the fuselage.

specifications

MODEL: Cessna 182 Skylane

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby Inc.

TYPE: giant-scale ARF

WINGSPAN: 94.75 in.

LENGTH: 76.75 in.

WING AREA: 1,249 sq. in.

WEIGHT: 17.75 lb.

WING LOADING: 32.7 oz./sq. ft.



ENGINE REQ'D: 1.08 to 1.48 2-stroke, 1.20 to 1.80 4-stroke, or 23 to 38cc gas

ENGINE USED: Zenoah G-26



RADIO REQ'D: 6-channel

RADIO USED: JR 662 w/JR 537 (flaps and ailerons), 507 (nosewheel and throttle) and Hitec HS475HB (elevator and rudder) servos



PROP USED: Pro Zinger 18x8

PRICE: $559

FEATURES: built-up balsa and plywood covered with Ultracote; painted fiberglass cowl and wheel pants; corrugated covering on control surfaces; built-up, airfoiled tail feathers; complete hardware package; assembly manual.

COMMENTS: the Cessna 182 ARF is an easy-to-assemble giant-scale model that features an outstanding true-to-scale appearance and a high-quality balsa-and-ply construction. Its excellent flight performance makes it a perfect choice for intermediate pilots who want to move into giant scale.

HITS

- Scale details, including antennas, cockpit interior and a trim scheme
- Ease of assembly and detailed instruction manual
- Excellent flight performance

MISSES

- None

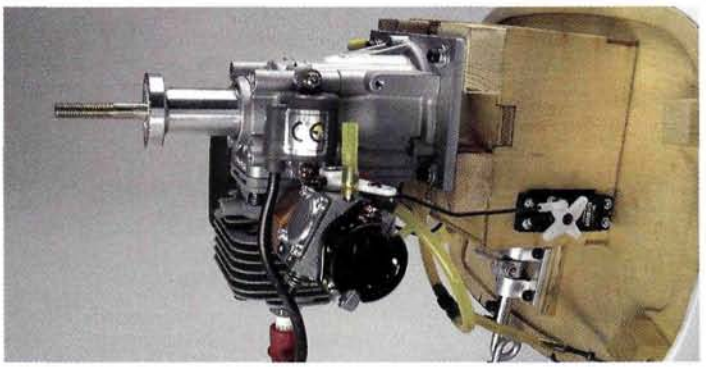
clearance for the servos. You'll need two, 24-inch servo-extension wires to connect the aileron servos to a standard Y-harness.

Setting up the flaps requires that the servos move in opposite directions. A reversed Y-harness easily achieves this and eliminates the need for additional extension wires. You can also reverse one of the flap servos using a computer radio to slave an auxiliary channel to the main flap channel. If you choose this option, you'll need two, 12-inch extension wires.

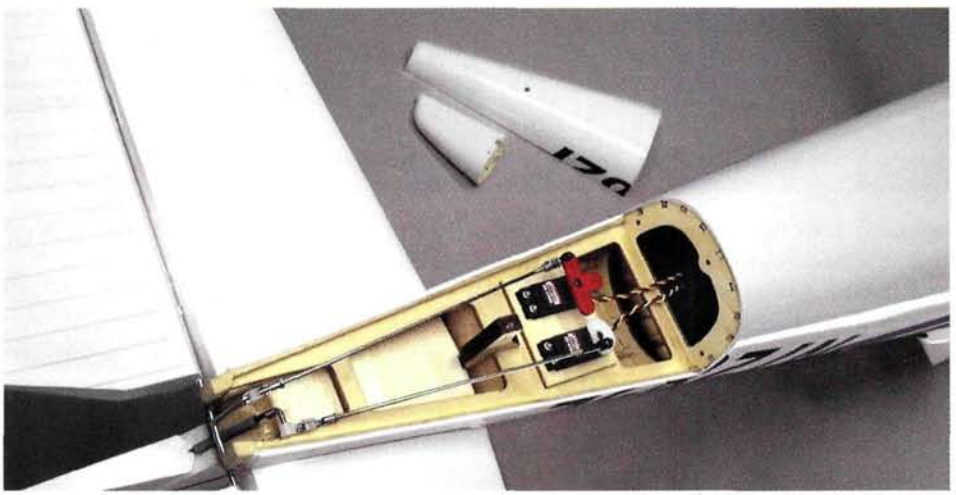
TAIL-FEATHER INSTALLATION

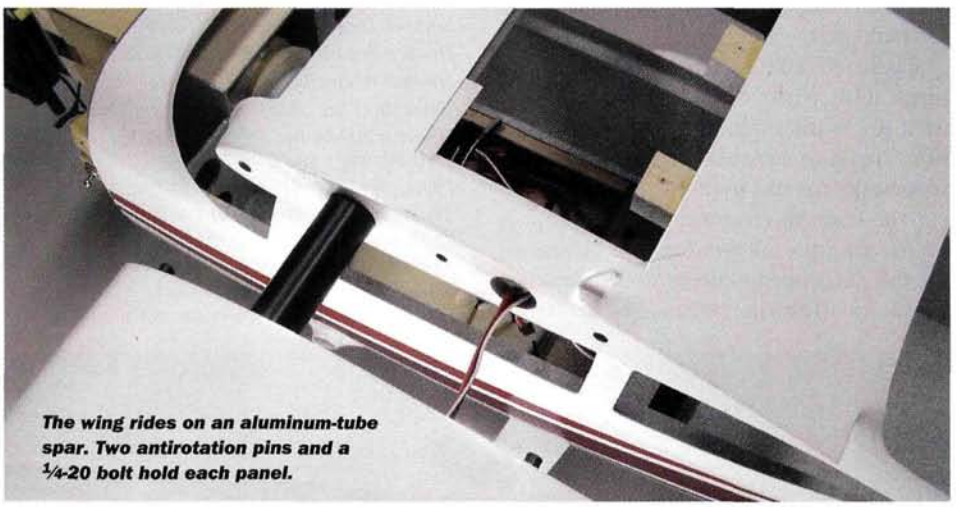
You must remove a portion of covering from the stabilizer's center section before you epoxy it into the provided balsa saddles. Carefully align the fin and glue it to the top of the fuselage. A notch in the rear of the fuselage and stabilizer keep the fin accurately positioned. I had to deepen this notch slightly to seat the fin properly.

The elevator halves are controlled by a metal control horn that arrives welded to a single torque rod. The rudder uses a single aileron-type torque rod. My only complaint with this kit was that the rudder's short torque-rod arm and its angle of movement created approximately ±¼ inch of play. Although I appreciate that both linkages are completely concealed, I would have preferred a slightly tighter setup on the rudder. Despite this concern, I haven't encountered any problems during flight.



Right: I needed ¾-inch spacer blocks to mount the G-26. The throttle servo is screwed to the engine-mounting box, so the linkage is short and easy to adjust. Below: elevator and rudder servos are mounted on a plywood tray beneath a removable hatch. A fiberglass tail cone conceals the control horns.





The wing rides on an aluminum-tube spar. Two antirotation pins and a ¼-20 bolt hold each panel.

FUSELAGE

Most of the construction centers on the fuselage. The first step is to position the wing, which rides on an aluminum-tube spar and to mount the struts and fairings. Each panel is retained by a single ¼-20 nylon bolt and aligned by two antirotation pins. You must drill the struts and mount them on the fuselage. Factory-installed T-nuts in each wing panel and in the fuselage sides accept the 4-40 retaining bolts. I decided to use screws instead of glue to secure the plastic strut fairings because this is how they are attached on the full-scale 182.

The instruction manual details how to mount the Zenoah G-26. After I had drilled the mounting plate, I bolted the engine to the firewall with four 8-32 bolts and T-nuts. I used ¾-inch pine blocks as standoffs to provide the proper distance between the engine and the firewall. I mounted the throttle servo in the engine-mounting box so that I'd have easier access to the throttle linkage.

Any modeler would be proud to own the Cessna 182 ARF.

Pass the two-piece, ¼-inch-thick aluminum main gear through two openings in the side of the fuselage and bolt it to the internal plywood plate. All the hardware necessary to attach the wheels and wheel pants is provided. A fiberglass wheel pant comes mounted to the nose gear. After I opened the base of the pant slightly with a Dremel Moto-Tool, I was able to mount the nosewheel on the bracket easily.

The nose-gear servo is mounted on the bottom of the fuselage and is concealed beneath a plywood hatch with the receiver and battery pack. I had to enlarge the pushrod exit hole in the firewall to allow the pushrod and control horn the range of motion they required. A plywood spacer block mounted between the aluminum nose-gear bracket and the firewall provides adequate clearance for the nose-gear spring. Two nylon bushings in this bracket prevent the nose gear from binding. I had to grind down the metal horn slightly to achieve a proper fit between the bracket and horn.

The elevator and rudder servos are mounted on a plywood plate in the tail

flight performance

With the G-26 in its nose, the Cessna balanced perfectly without any added weight. I mixed flap to elevator offset and set up the control throws according to the manual's recommendations.

TAKEOFF AND LANDING

With a wide-stance tricycle setup, ground handling was excellent on grass and pavement. I held a slight amount of right rudder to keep it tracking straight, and it ran for about 150 feet along the grass runway before rotating. Once airborne, the Cessna accelerates quickly. This model has a fair amount of mass and needs to be held on the ground until flying speed is achieved.



Properly landing this airplane requires at least intermediate pilot skills. The judicious use of power and flaps is a must. My first landing was deadstick; I kept the flaps up to avoid prematurely reducing the airspeed and inducing a low-speed stall. The clean airframe quickly sailed past me, and I had to take an unexpected walk.

Subsequent power-on landings allowed the precise control of descent and landing speeds. Keeping the nose slightly down, I used ½ flaps on the downwind leg and base leg. Once lined up for final, I applied full flaps and flared to a main-wheel touchdown. With careful throttle management, touchdowns and rollouts can be made to mirror those of the full-scale Skylane.

LOW-SPEED PERFORMANCE

At slower speeds with the flaps deployed and some power on, all controls remain positive. Fully extending the flaps is like stepping on the brakes and requires that the elevator be trimmed down to prevent the model from ballooning. The model will tip-stall if you slow it too much. With the addition of power and a reduction of elevator backpressure, recovery is quick.

HIGH-SPEED PERFORMANCE

Like its full-size counterpart, the 182 is clean and fast. Although it isn't a speed demon, it covers a lot of sky quickly. It had a very solid, stable feel at full throttle and showed no sign of control-surface flutter. It's very enjoyable to fly and handles very well at all throttle settings. After flying this model, it's easy to see why Cessna refers to the full-scale Skylane as the "SUV of the air."

AEROBATICS

Although the full-size 182 was not designed for aerobatics, this model can do all the basic maneuvers. The G-26 supplied ample power for loops and stall turns. Barrel rolls required coordinated rudder input, and with power on, were entered at approximately a 30-degree positive attitude. Increasing aileron deflection by an additional ¼ inch up or down gave the rolls a much more positive feel. The Cessna flies in a very scale manner and is impressive to watch fly.

section and are concealed by a built-up hatch that is retained by a single wood screw. The servo wires are routed through a fiberglass tube to the cabin area. You'll need a 24-inch extension wire for each servo.

Although the manual indicates that standard servos are adequate for all control surfaces, I used Hitec 475HB servos in the tail because they provide 60 oz.-in. of torque on a 4-cell pack. The entire model rides on a single elevator servo, and in an airplane of this size, the extra torque provides some added peace of mind.

FINAL DETAILS

The cockpit's interior is basic and easy to assemble. The dashboard arrives painted and covered in black Ultracote. To finish it, you need only apply the self-adhesive instrument-panel decal and glue the assembly into the cockpit. I installed the tinted windows using RC-56 canopy glue and filled a few gaps in the rear window mount with silicone sealant.

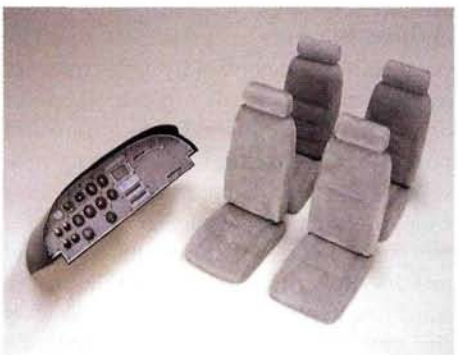
The two-piece seats are finished with a simulated fabric and must be glued together with a silicone adhesive. Balsa blocks come glued to the cabin floor to provide a mounting base. The seats are retained by Velcro, so they're easy to remove to access the radio gear.

I painted a Pro Zinger 18x8 propeller black with white tips and topped it off with a 3¼-inch Tru-Turn Ultimate spinner. Tru-Turn manufactures this spinner specifically for this model and can custom-cut the cone to clear any desired prop. A Menz-cut cone allowed ample clearance for the Zinger prop and provided smooth, vibration-free operation. As the final touch, apply a self-adhesive Skylane decal to each side of the fin.

CONCLUSION

Any modeler would be proud to own the Hangar 9 Cessna 182 ARF. Its high-quality construction, scale appearance and good flight manners make it impressive both on the ground and in the air.

Dremel Tool *(800) 437-3635; dremel.com.*
Du-Bro Products *(800) 848-9411; dubro.com.*
Hangar 9; *distributed by Horizon Hobby Inc.*
Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*
Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*
JR; *distributed by Horizon Hobby Inc.*
Tru-Turn Precision Model Products; *distributed by Romco Mfg. (713) 943-1867; tru-turn.com.*
Zenoah; *distributed by Horizon Hobby Inc.*
Zinger; *distributed by J&Z Products (310) 539-2313; zingerpropeller.com.*



The cockpit interior consists of a printed control panel and four molded plastic seats.







Distributed by Global Hobby, Sportsman Aviation's products are geared to experienced modelers. Its Paramount 60 Freestyle ARF adds a new dimension to the freestyle 3D airplanes that are flourishing in the RC market. This midsize aerobat is easy to transport, and its 3D maneuvers will dazzle you and challenge your dexterity, ingenuity and imagination.

The ARF plane can be assembled in fewer than 18 hours. Its components are well constructed of balsa, lite-ply and fiberglass. A fiberglass engine mount, cowl and wheel pants, a canopy and good-quality hardware package are provided. The iron-on covering was flawless, so I did not have to heat-shrink any part of it.

Sportsman Aviation

Paramount Freestyle

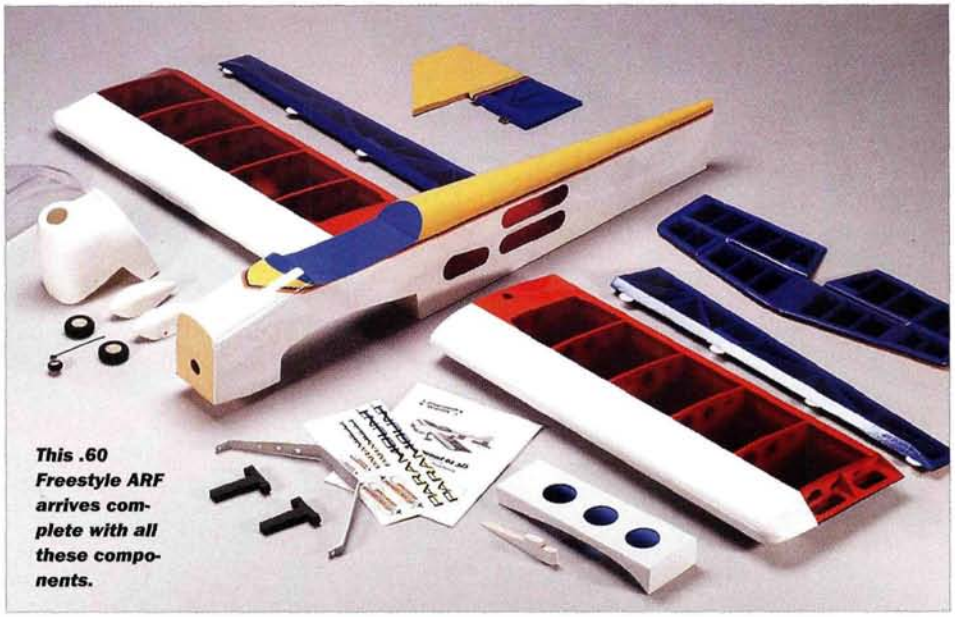
by Carmen Luciano



60 ARF

Versatile .60-size 3D aerobat

PHOTOS BY DERON NEBLETT



This .60 Freestyle ARF arrives complete with all these components.

specifications

MODEL: Paramount 60 Freestyle ARF

MANUFACTURER: Sportsman Aviation

DISTRIBUTOR: Global Hobby Distributors

TYPE: freestyle 3D ARF

WINGSPAN: 54 in.

WING AREA: 795 sq. in.

WEIGHT: 5 lb.

WING LOADING: 14.49 oz./sq. ft.

LENGTH: 57 in.

ENGINE REQ'D: .61 2-stroke or .91 4-stroke

ENGINE USED: .61 Magnum 2-stroke

RADIO REQ'D: 4-channel w/5 servos (rudder, elevator, throttle, ailerons)

RADIO USED: JR 8103, 2 JR 531 servos (ailerons), 3 Hitec servos (elevator, throttle, rudder)



PROP: 12x6 Master Airscrew

FUEL: Cool Power 15%

PRICE: $209.99



FEATURES: iron-on covering; all-wood airframe with balsa-sheeted Styrofoam turtle-deck insert; 26-page instruction manual; fiberglass cowl and wheel pants; hardware package, fuel tank, pull-pull cables for rudder; fiberglass engine mount; CA hinges; precut hinge slots.

COMMENTS: the Paramount is quite the looker for a freestyle 3D aerobat. It was easy to assemble, except for the elevator control rods and the cowl alignment and cutouts. Its covering and its aerobatic, freestyle and 3D capabilities set this plane apart from the rest. It's made for intermediate and experienced pilots.

HITS

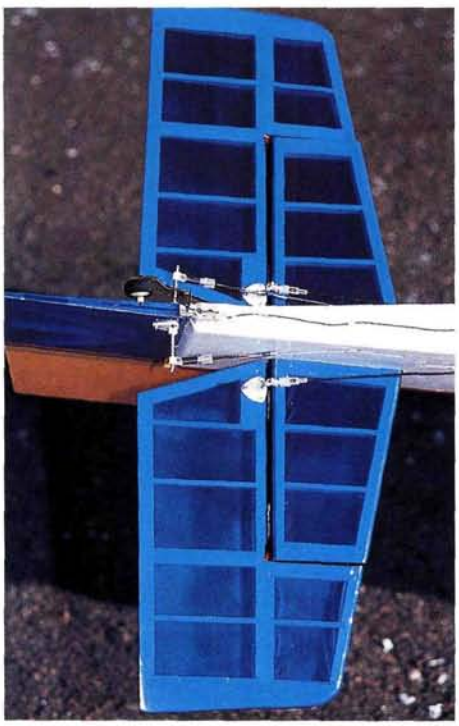
- The iron-on covering was wrinkle-free, and the wing wasn't warped.
- The fiberglass wheel pants are thicker than those on most other ARF models.
- The hardware package is topnotch, especially the horns and clevises.

MISSES

- The balsa dowel and wire elevator control rods were below par compared with the other hardware.
- The decals have a solid white background, but transparent would have looked better.

ASSEMBLY

• **Wing and tail.** All the hinge slots had been cut at the factory, and I didn't have to enlarge them. The instructions tell you to glue the precut CA hinges to the ailerons and then to the wing. Remember to match the color scheme (the tops of the wing and aileron are red; the bottoms are blue). Remove a thin strip of covering from the hinge slots to ensure better adhesion. I suggest that you remove this strip of covering from the bottom of the slots so it will not be visible from the top surface; this may not improve performance, but it will certainly look better.



The tail section: the tailwheel assembly, the pull-pull rudder cables and the split elevator pushrods.

Installing the aileron servos in each wing half was easy with the pull-through strings provided in the wing. The JR 531 servos fit neatly into each wing's servo tray. They sit low and flush with the wing chord—a nice touch.

The next job was to join the wing panels. Note the orientation of the dihedral brace; a slight dihedral is built into the wing.

I attached the horns and pushrods to the ailerons with the supplied clevises and pushrod keepers. Then I aligned the stabilizer and glued it to the fuselage slot. The factory prep was precise, and I didn't have to trim or shim the stabilizer-mounting slot in the fuselage. I installed the tailwheel assembly in the rudder and affixed it to the sub-dorsal fin on the fuselage for strength and stability. I hinged the elevator and rudder in the same way as I hinged the ailerons. I attached the large threaded horns to the rudder for the pull-pull setup and placed the elevator horns on each side for the split pushrod assembly.



The servo-tray assembly viewed from the bottom of the fuselage.

• **Servos, cables and pushrods.** I installed ball-bearing Hitec servos for the rudder and elevator and a standard Hitec servo for the throttle. They fit neatly in their own compartment in the fuselage, aft of the wing's trailing edge. Installing the removable hatch on the fuselage bottom completed the radio installation.

Follow the dimensions given in the manual when you cut the exit slots in the aft fuselage for the rudder pull-pull cables and the split elevator pushrod. They line up accurately for great control-surface response. When you get to step 20, which deals with the rudder pull-pull cables, I advise that you complete the tasks in a different order from the one given. The manual tells you to crimp the cable at the rudder horn first and then make adjustments at the servo, but this would make things difficult because the servo is deep inside the fuselage, and there isn't a lot of room. I suggest that you secure and crimp the cable at the servo first, and then run the cables to their aft exit slot, and make your adjustments at the rudder horn, where you will have plenty of room to maneuver your tools.

Next, I assembled the split pushrod for the elevator. A balsa dowel, three wires of the appropriate size and shrink-tubing come in the kit. It wasn't easy to install this system or to balance the split elevators' movements. (This is the only hardware I consider to be below par.) With patience and mechanical adjustments, however, I succeeded in making it work.



The Paramount includes all the hardware for the independent aileron setup. It provides more direct control, as well as more radio programming options.



flight performance

TAKEOFF AND LANDING

Takeoffs are, well, simply effortless. Point the plane into the wind and advance the throttle. After only a few feet, it's off the ground and climbing at a good clip. The generous wing area and thick symmetrical airfoil make for easy, gentle landing characteristics. Landing approaches can be made at a steep angle without a lot of speed buildup.

LOW-SPEED PERFORMANCE

The Paramount has excellent slow-speed flight characteristics. It slows down nicely under solid control; it doesn't have any tendency to snap when it stalls; and it can do slow-speed aerobatics at ½ throttle all day long—lots of fun!

HIGH-SPEED PERFORMANCE

Using a low-pitch propeller helps keep the top speed moderate. This is my preference, as it provides more vertical performance and less acceleration through down lines. The Paramount is very responsive at high speeds, but it's still easy to control, and it tracks well. It doesn't exhibit any high-speed stalling in tight turns or loops.

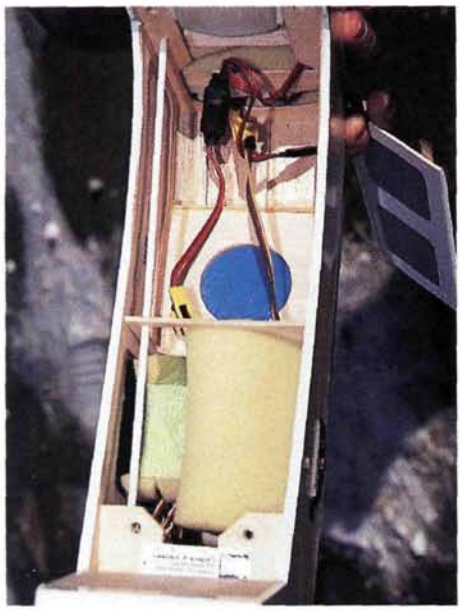
AEROBATICS

The Paramount is a very capable 3D performer that will do any maneuver you can throw at it. It will do tail tumbles that look as if its fuselage is hinged in the middle. On high rates, rolls are just a blur; no down-elevator input is needed, nor is there time to do it! With the Magnum .61, the model will hover, but more power is needed to sustain the hover and to pull out with authority. Knife-edge flight with the big rudder is effortless, but it does show a little coupling in both roll and pitch. The Paramount 60 Freestyle ARF is great for pilots who want to learn 3D aerobatics and experts who want an exhilarating Sunday flyer. Take one for a spin!

• **Engine and cowl.** At first glance, I thought the directions for this section were awkward and would make the fuselage/cowl alignment difficult. If you follow the steps exactly, however, and use double-stick tape to hold the fuselage vertical, it's easy. The firewall, engine mounts and cowl are angled to accommodate the engine's right thrust. On the fiberglass cowl, I drew the outlines of the openings required for the engine and then cut the openings with a rotary tool. I enlarged the bottom opening for the glow plug to allow a better airflow. The outward airflow keeps the engine cool, and for proper cooling, the outward flow should be three or four times greater than the inward flow.

I marked the position of the throttle pushrod on the firewall and drilled the outer pushrod-tube hole. Last, with the engine inverted, I attached the throttle pushrod and the .61 Magnum 2-stroke to the mounts. I fastened the cowl to the fuselage with washer-head screws. Remember to make the holes in the cowl slightly larger than the screws' diameters to avoid the creation of "stress risers"—small cracks in the fiberglass that will lead to larger cracks.

• **Back to the wing.** To complete the wing, glue the two leading-edge dowels into the predrilled holes and install the



The fuselage opening over the wing is spacious and easy to access.

blind nuts in the fuselage wing-mounting plate. Then align, glue and drill the plywood wing-bolt reinforcement plate and attach the lower wing fairing.

• **Final installations.** I used a three-line setup for the fuel tank with an R/C City fuel-dot fitting. The servo hatch, landing gear and radio components were easy to install in the spacious fuselage. I routed the antenna through the bottom of the fuselage behind the hatch and secured it with three short lengths of inner Nyrod. I installed the battery (a 4.8V, 700mAh 4-cell Ni-Cd) in the fuel-tank compartment to help balance the model at the specified CG.

I used a 2¼-inch plastic spinner and a 12x6 Master Airscrew prop to complete the power system. Don't forget to balance your prop.

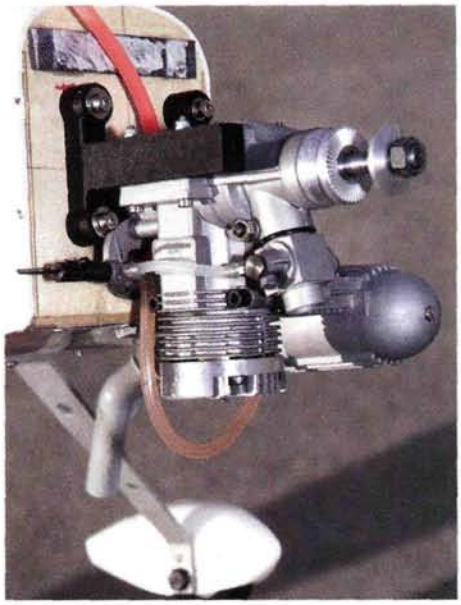
I cut and trimmed the molded canopy and glued it to the cockpit. Before taking this final step, though, I had to decide who would pilot this airship. With such a novel-looking plane, just any old pilot would not do. I chose a character who "lives in a pineapple at the bottom of the sea"—an absorbent little fellow named "SpongeBob SquarePants." What a great final touch for such a unique freestyle model!

The plane balanced laterally without my having to add any weight to the wingtips. To get the specified CG, however, I had to add an additional 3 ounces of lead, which I secured to the firewall with glue and screws. I began with the CG at 4 inches behind the leading edge. If you want your model to be more aerobatic, you can increase this to 5 inches later.

Since the engine is inverted, gravity can cause excessive fuel to be fed to the carburetor if you install the fuel tank as recommended. I had to drop the tank by ¾ inch by enlarging the hole in the firewall and cutting a small hole in the bottom of the fuselage. I covered this with thin plastic sheeting, since the tank now protrudes through the opening, but the cowl hides this.

FINAL THOUGHTS

Catalog and Web-page photos don't do justice to this 3D freestyle model. As you build the Paramount and add its striking multicolored transparent and solid covering, you'll be eager to complete its construction and show it off. You'll have no trouble getting it from the bench to the field in fewer than 18 hours. With a computer radio, you'll be able to set the throws to produce a docile aerobat or one with full aerobatic capability that does spectacular 3D maneuvers.



The Magnum .61 is a fine choice for the Paramount. With it, the model can hover and perform any aerobatics short of unlimited vertical maneuvers.

Cool Power; *distributed by Morgan Fuel (800) 633-7556; morganfuel.com.*

Global Hobby Distributors *(714) 963-0329; globalhobby.com.*

Hitec RCD Inc. *(858) 748-6948; hitecrcd.com.*

JR; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

Magnum; *distributed by Global Hobby Distributors.*

Master Airscrew; *distributed by Windsor Propeller Co. (916) 631-8385; masterairscrew.com.*

R/C City Products; *distributed by Planes Plus Inc. (630) 904-9983.*



Cutouts and cowl installation.



The aluminum gear and foam wheels are included in the kit, as are the fiberglass wheelpants. Note the alignment pin that makes the pant installation much easier.


AVEMCO
EXTRA 300S
AVEMCO
AVEMCO

Great Planes Extra 300S 1.60 ARF

Story & photos by Jerry Smith



A ¼-scale showstopper!

The last seven U.S. Unlimited national aerobatic champions have competed with an Extra 300; that's quite a record! Produced by the Walter Extra Flezgeugbau in Germany, the Extra 300 bears impressive credentials that include a roll rate of 400 degrees per second and the ability to withstand plus or minus 15G. Put yourself in the cockpit of one of these beauties, and you can produce violent maneuvers that are the equivalent of riding a Brahma bull.

The Great Planes ¼-scale Extra 300S 1.60 ARF is a good representation of the Avemco-sponsored Extra 300S flown by Gene Soucy in competition and in his airshow. Looking it over closely, you will notice its increased tail surface and slightly larger ailerons; those characteristics certainly contribute to its outstanding 3D performance.

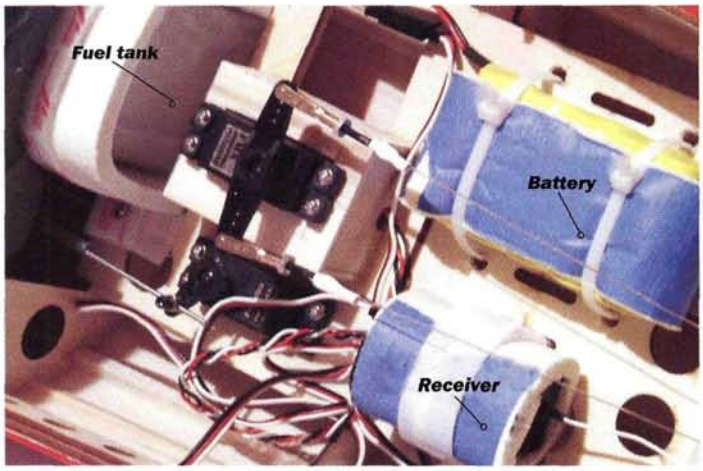


Assembling the Extra is very straightforward, and the clearly written, 27-page manual provides many photos and offers extensive information on flying and flight trimming.

When I spread the parts out on the floor to thoroughly inspect them, I could immediately see that this was going to be an impressive model! The Extra features excellent built-up construction, expertly applied MonoKote covering and trim and a painted fiberglass cowl and wheel pants. It also comes with a polished aluminum spinner, landing gear, clear canopy, wheels, all necessary hardware and scale wingtip aerobatic sighting reference guides.

WING ASSEMBLY

The wing comes in two, 37-inch panels. I like this because it's easier to work on a panel than a whole wing. After installing the aileron with the provided CA hinges, I removed the covering over the servo well with a micro-tip soldering iron. Running a heated iron tip around the edges of the opening removes the excess material and seals the covering to the edge at the same time.



There's plenty of room in the radio compartment. The elevated rudder servo allows the pull-pull lines to clear the wing hold-down support and fuselage bulkheads. The battery and receiver just about sit on the CG, and the fuel tank is close to it, too.

Before you can mount the servos, you'll need to attach two 12-inch extension leads to the servo connectors. To keep the connector pairs together, I looped a small plastic zip-tie around them and pulled it tight. With the servos mounted and the lead pulled through the wing, the aileron control horns were next. The hardware included in the kit was fine, but I really wanted to try out some new Du-Bro heavy-duty control horns that I already had. These horns feature a ½-inch offset in the horn connector, and you only need to drill a single hole to mount them.

I used FMA PS705MBB servos for all of the control surfaces. These metal-gear servos produce 106 oz.-in. of torque—more than I needed, but they provide good response. I also like the connectors and the heavier lead wire on them.

The 4-40 pushrod between the servo arm and the control horn is very short. On one end, you must solder the clevis into place. After you've finished working on the wing panels, slide them together onto an anodized-aluminum tube spar. A pin near the trailing edge will keep the panels aligned. My wing halves mated perfectly! The wing also aligned with the same precision when mounted on the fuselage. I was amazed at the degree of accuracy built into this almost-ready-to-fly (ARF). There are several benefits to a wing assembled on an aluminum spar: you can leave it in one piece, carry it in two pieces in a wing bag for protection and work with one panel at a time on the bench when setting up control-surface deflection.

TAIL INSTALLATION

With the wing assembled, I turned my attention to the airfoil-shaped tail. I always

specifications

MODEL: Extra 300S 1.60 ARF

TYPE: ¼-scale aerobatic

MANUFACTURER: Great Planes Model Mfg. Co.

WINGSPAN: 74 in.

LENGTH: 69 in.

WING AREA: 1,048 sq. in.

WEIGHT: 12 to 13.5 lb.

WING LOADING: 26 to 30 oz./sq. ft.



ENGINE REQ'D: 1.20 to 1.60 2-stroke or 1.20 to 1.80 4-stroke

ENGINE USED: YS 1.20 FZ 4-stroke

RADIO REQ'D: 8-channel w/ 6 servos (ailerons, elevator, rudder and throttle)



RADIO USED: Futaba 9CAP and FMA PS705MBB servos on control surfaces

PROP USED: APC 15x8



FUEL USED: PowerMaster 20% nitro, 20% synthetic oil

PRICE: $379.99

FEATURES: built-up construction covered with MonoKote; painted fiberglass cowl and wheel pants; clear canopy; landing gear; two decal sheets; photo-illustrated assembly manual; complete hardware package with fuel tank, engine mount and wheels.

COMMENTS: the Extra 300S 1.60 ARF is an outstanding aerobatic airplane and is excellent for those who want to get started in IMAC flying. The plane's quality and workmanship are very good, and the MonoKote covering and trim have been expertly applied. It's also an excellent flyer.

HITS

- Excellent scale detail.
- Easy-to-fly, stable airplane.
- Painted cowl and wheel pants.
- Airfoil-shaped fin and stabilizer.

MISSES

- Complicated tailwheel installation.

worry about getting the tail on straight, but this time, all went well. The supplied elevator control horn is sturdy and has a large footprint; it's held in place on the plywood hard point with four screws. This keeps the top of the elevator clean. The elevators are split; each is powered by a servo in the tail with the output arms in an opposite configuration to avoid reversing one servo. The 4-40 pushrods (the same as the aileron pushrods) are short and adequately stiff. With this setup, you'll need to install a Y-harness and a 12-inch servo connector extension to reach the receiver.

Because I used slightly heavier servos, I thought the plane might be tail-heavy if the rudder servo was also mounted there. I decided to go with a pull-pull system on the rudder and mounted that servo on the servo-mounting board, close to the airplane's CG. This turned out to be the right decision; I had no problems obtaining the CG stated in the manual.

To hook up the rudder, I used Du-Bro heavy-duty control horns with a piece of 6-32 threaded rod and a Du-Bro 4-40 pull-pull system. For the pull-pull lines to clear the bulkheads in the fuselage and the wing hold-down support, I had to raise the aileron servo 7/8 inch off the fuselage servo mount. I installed a large Du-Bro Super Strength servo arm on the rudder servo. It perfectly matched the control-horn width on the rudder, and the hookup was complete.

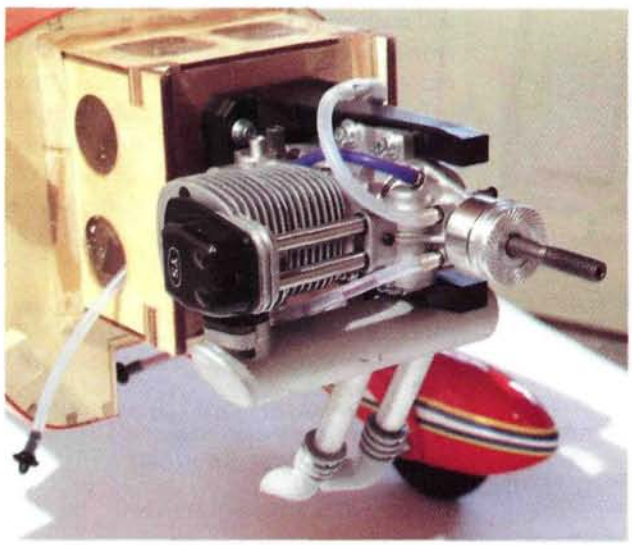
When I installed the tailwheel, I thought the linkage and hardware required to hook it up could have been simplified. If you later decide that you want to set your Extra up for 3D maneuvers, you'll need to rework the tiller arm for more throw. Although it doesn't look as scale, I substituted a simple Sullivan no. S861 tailwheel.

RADIO INSTALLATION

There's plenty of room in the radio compartment (even if you have big fat hands), and gobs of room in case you have to shift the battery to correct the CG. I wrapped a 1600mAh, 5-cell Ni-Cd pack in foam and mounted it very close to the specified CG and used large, plastic zip-ties to fasten it into place on the servo-mounting board. Because I had already installed all of the servos, I had to mount only one standard servo to operate the throttle. In this case, it was almost a straight shot from the servo arm to the throttle arm on the engine, and I used the supplied hardware, pushrod and sleeving.

I mounted a Maxx Products Intl. switch harness on the fuselage side below the canopy. This new product has a built-in onboard battery checker! It also has a three-LED display (green, yellow and red) that monitors the status of the flight pack and allows you to test the battery under the actual load of the onboard equipment. The switch is factory preset for 4.8V operation. For 6V operation, you have to cut a jumper-wire loop that's on the outside of the switch. The LEDs are very bright; a quick glance will let you know whether your flight pack is powered. You can also charge the receiver batteries using the connecter in the switchplate.





Above: the kit hardware has been mounted on the elevators; this good, strong horn has a large base for support. The rudder features a Du-Bro Heavy-Duty control horn and pull-pull system. A Sullivan tailwheel simplifies the tailwheel arrangement, eliminating unnecessary hardware to operate it, even if you add more throw.

Left: I used a YS 1.20 engine and mounted it with a Slimline Pitts-style muffler. All of it fits nicely under the cowl. I covered the large holes in the engine box with wide, transparent tape to prevent pressurizing the fuselage interior. The cowl can be removed and installed with exhaust diverters in place.

> This plane is rock-steady and goes wherever you point it.

ENGINE AND COWL

Installing my YS 1.20 FZ engine was quite easy with the supplied adjustable mount. There's a mounting template on the last page of the manual; just cut it out and paste it onto the firewall (make sure that you align the centerlines), drill the holes and install the blind nuts in the firewall. After I had installed the mount, I positioned the engine and clamped it into place at the required distance from the firewall. I marked the mounting holes for the engine with a Great Planes Dead Center engine-mount locater, and then I removed the mounts and drilled and tapped them in a drill press for accuracy.

I used a Slimline Pitts-style muffler with the YS 1.20. I like this muffler because it has a support bracket that ties into the engine-mount bolt, so the mount is nice and solid. All of this fits completely under the cowl; I did have to add a few Du-Bro exhaust extensions to the muffler pipes to get them outside! To keep the extensions in place, I drilled holes and installed small screws through them into the exhaust pipes.

Great Planes provides a wonderful cowl alignment tool that makes it simple to install the cowl and align the engine crankshaft with the hole in the cowl—even if you use a spinner on the prop. This is really a great tool.

I installed a Du-Bro Fuel It fueling system in the side of the cowl so that it would be easy to refuel the Extra. I moved the fuel tank as far back toward the CG as I could,

flight performance

TAKEOFF AND LANDING

With the YS 1.20 in its nose, the Extra will take off at a little more than ½ throttle and lift off at a 30-degree climbout. For landing, if you reduce the engine idle, it comes in easily for a 3-pointer; this plane does like a little throttle till the very end. Wheel landings are a delight to see and do.

LOW-SPEED PERFORMANCE

I performed several mild stalls, and each time, the Extra mushed out of them straight forward. I'm sure the good lateral balance had a lot to do with it as well as the excellent wing planform and the flying surface moments in the design. Slow flying proved excellent with good control right down to the end; that proved the worth of its large control surfaces. The airplane was very predictable and exhibited no bad flight characteristics on the low-speed end; it's a real pussycat.



HIGH-SPEED PERFORMANCE

Crank up the throttle, and the Extra will move out moderately fast. At high speeds, it's extremely agile and very responsive. Inverted flight, at full throttle, needs very little down-elevator to hold it level, which indicates the CG was very close to being right on. Rolls are very axial and need little down with the stick as the airplane rotates. It tracks very well through loops, stall turns and high-speed passes.

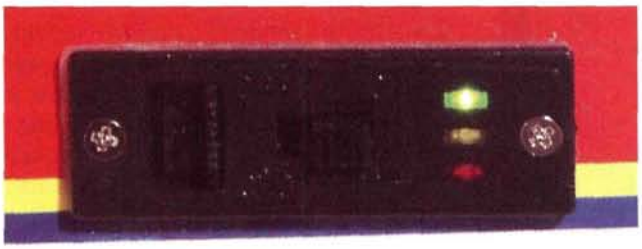
AEROBATICS

This is where the Extra is in its own element of purposeful design. I was more than satisfied with how it performed with the YS 1.20. Snap rolls, spins, Cuban-8s, stall turns, loops—I mean nice big round ones!—are my bag, and the Extra 300 does them all with ease. The YS 1.20 did a very creditable job here. Pilots who have higher ambitions than I can get the Extra to perform 3D maneuvers by using more power and by setting the control-surface deflections higher.

wedged foam around it, and secured the back end with Velcro. The YS engine isn't affected by the placement of the fuel tank, but it's necessary to keep it below the carb to prevent siphoning when the engine isn't running. The carb pressurizes the tank to about 6psi and does not rely on fuel draw.

chase out the air. The photo on the front of the instruction manual will give you an idea about where to place the decals.

Every airplane needs a pilot, and I found a fully painted one called "Harro" from Hobby Lobby for $20 that comes ready to install. He looks great with his helmet and goggles and is about the right size; I only had to cut ¼ inch off the base for his head to clear the canopy. I painted the interior of the cockpit flat black, glued the pilot into place and attached the canopy with four small screws on each side. This way, I can easily remove the canopy.



The Maxx Products' switch has bright, battery status LEDs, so a quick glance will tell you whether your battery is flight ready.



The included cowl-alignment tool ensures absolute cowl alignment with the engine crankshaft. The step in the tool supports the cowl on the crankshaft when you install the mounting screws. At the same time, it gives you the proper clearance between the spinner's backplate and cowl. Wonderful!

FINISHING TOUCHES

The Extra 300S really comes to life when you apply the decals, and two excellent sheets of them are included in the kit. I really appreciated that Great Planes went to the trouble of applying the large, underwing "Avemco" markings. Before I applied them, I cleaned the plane's surfaces with isopropyl alcohol, used soapy water to slide the decals into position and used a squeegee card to

With the Extra now complete, it was time to set up the control-surface deflections and check out the CG. Using a Great Planes AccuThrow Deflection Gauge, I set up the endpoint travels on the control surfaces in accordance with the manual and programmed my Futaba 9CAP computer radio. Next, I weighed the Extra (12.2 pounds) and balanced it to check the CG, which the manual noted should be 5½ inches back from the leading edge.

CONCLUSION

I've looked at many airplanes, and the Great Planes ¼-scale Gene Soucy Extra 300S ARF is one of the best I've seen. It's also an excellent airplane to fly, and its bright scheme makes it easy to see in the sky. It's very predictable in flight, has no bad characteristics and really shines when you flip the dual-rate switches and hit the throttle. This plane is rock-steady, smooth and goes wherever you point it. If a good flying, well-built, beautiful aerobatic airplane is your ambition, then you won't go wrong with this Extra 300S. Like Gene Soucy, you can enjoy one, too!

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

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Sheet Foam Wings

A simple technique for strong, straight panels

by Dave Garwood

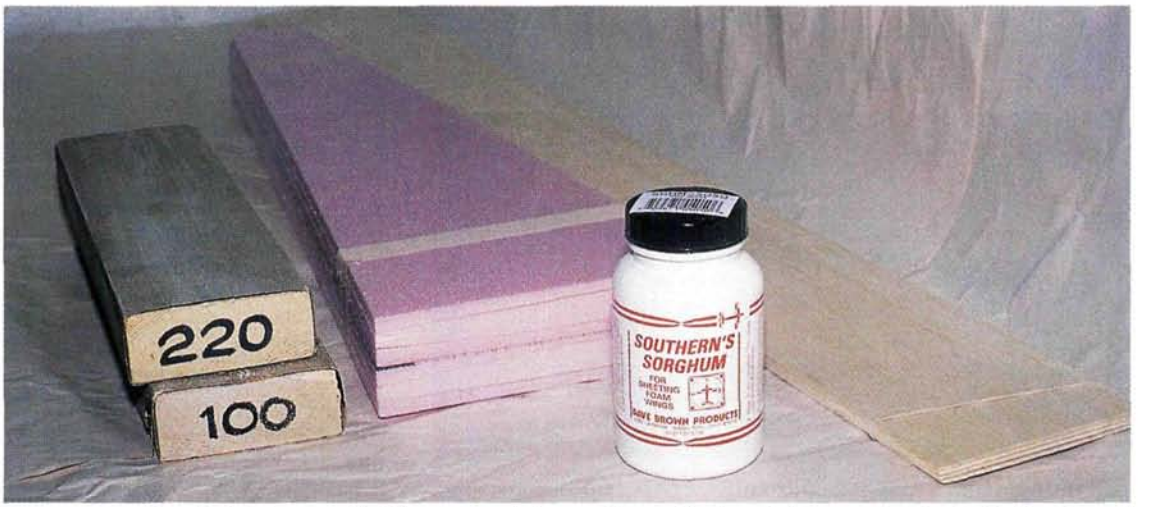


Foam-core wings have two advantages over rib-construction wings: high strength and accurate airfoils. Although sheeting a wing may seem complicated, it's really just a series of steps with careful work needed at a few stages. Once you build sheeted-foam wings, you may never go back to stick-built construction. Follow along as I show you how I sheeted a foam-core wing for my Cavazos Slope Scale P-39 Aircobra.

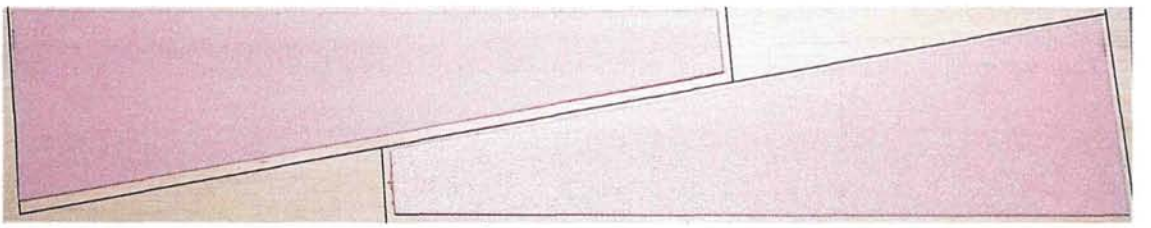
The cores are generally cut with a hot wire; they may come in a kit, they can be custom ordered, or you can cut them yourself. The sheeting material is commonly 1/16-inch-thick balsa but can be thinner or thicker balsa; it can even be 1/64- or 1/32-inch-thick plywood. Sheeting adhesive can be epoxy, spray contact cement, brush-on contact cement or double-stick tape. Use what you're comfortable with, and make sure that your chosen adhesive doesn't attack foam.

allowing about 1/2-inch clearance all around. The extra sheeting material allows for slight misalignments. Trim the skins for the top and bottom of each wing panel.

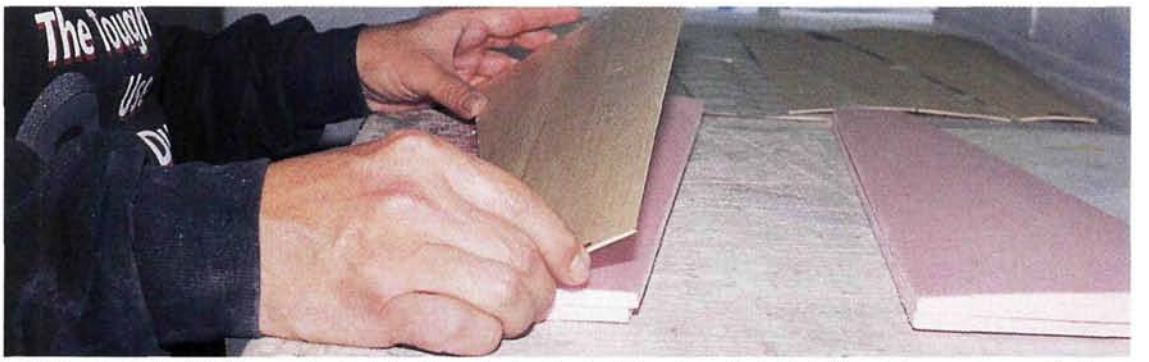
Lay the wing-skin panels on newspaper or wax paper and apply the sheeting adhesive of your choice. Epoxy is strong but heavy, and it allows you to align the skin after you have applied it to the foam-core. If you use epoxy, you'll need to vacuum-bag or heavily weight the wings down while the epoxy cures. Contact cement is lighter than epoxy



Components and materials for sheeting foam-core wings—sandpaper blocks, wing-cores, wing-sheeting adhesive and balsa sheets for the external wing surface.



Make two 6x36-inch panels by joining 3-inch-wide, 1/16-inch-thick balsa sheets. Lay the wing-core saddles on the panels and mark them with about 1/2-inch clearance all around.



Lay the trimmed wing-skin panels coated with contact adhesive into place. Note that the wing-core is supported by a foam saddle. To avoid warping the wings as you apply the sheeting, it's important to work on a flat surface.

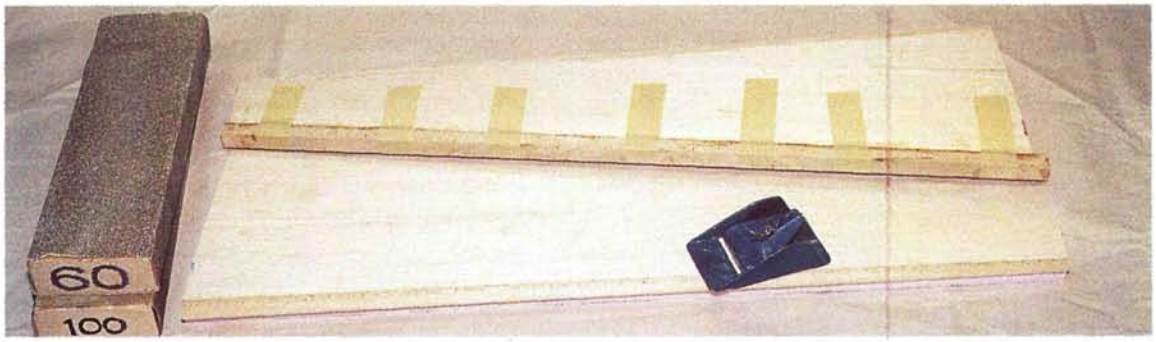
The first step is to prepare the cores by lightly sanding them to remove the "hair" left after the hot-wire cutting. Worn 220-grit sandpaper works great for this job.

Make wing skins out of the balsa sheeting by gluing sheets together edgewise. True the edges with a sharp blade and a long metal ruler and/or long sanding blocks. Tape the sheets together and, bending the sheets back with the tape acting as a hinge, apply your choice of adhesive. I like aliphatic resin (yellow carpenters' glue) for this because it sands well. Some builders like CA glue because it cures faster.

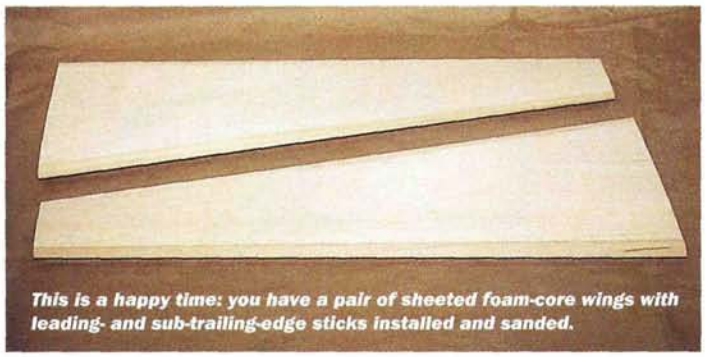
When the glue is dry, sand the skins smooth, paying particular attention to the glue seams. Lay the foam-core saddles on the skins, and mark the cuts,

and strong enough, but you can't realign the parts after they've touched each other. Some folks use double-stick wing-skinning tape, but it has the disadvantage of contact cement, and I don't think it makes as strong a bond as the other two adhesives. My current favorite wing-skinning adhesive is Southern's Sorghum from Dave Brown Products. It is nearly odorless, and it has never failed me in use. I'm also happy with Borden's Polyurethane ProBond glue, which seems to be favored by the giant-scale builders.

Now, the scary part: laying the glue-laden skins on the cores. If you work carefully, you can drop them into place by applying one edge and rolling them across the core. Alternatively, you can use a slip-sheet of wax paper: lay the skin in place, and



A pair of wing halves with leading- and sub-trailing-edge sticks applied. The rear panel still uses masking tape to hold the leading-edge stick in place while the glue dries; the forward panel has been shaped with the modeler's plane and long sanding blocks.



This is a happy time: you have a pair of sheeted foam-core wings with leading- and sub-trailing-edge sticks installed and sanded.

pull the paper out a little at a time. Either way, to build a wing panel that's as straight as possible, it's important to work with the core supported by the saddles. If you used epoxy, weight the cores and let them cure for 24 hours. If you used contact cement, rub them thoroughly all over to ensure good adhesion.

Trim the overhanging sheeting material with a knife, a plane, or a sanding block. Reassemble the stack of cores and saddles (the same way as they came in the kit), and sand all four edges flush with the saddles.

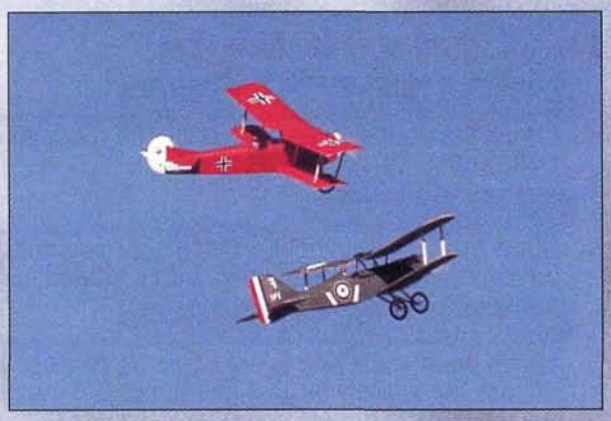
When you take the wings out to inspect the finished parts, I think you'll be happy with how light and stiff they are and how accurately shaped the airfoil is.

Now your wings are sheeted, and the final step in completing the wing panel is to attach the leading-edge stock and the trailing-edge or sub-trailing-edge stock, again using an adhesive you have experience with. I've used epoxy, aliphatic-resin glue and Borden's ProBond glue. Hold the parts together with short strips of masking tape, put them back in the saddles and weight the cores down while they dry or cure. When you pull the wing panels out again, shape the leading and trailing edges with a small plane and sanding blocks.

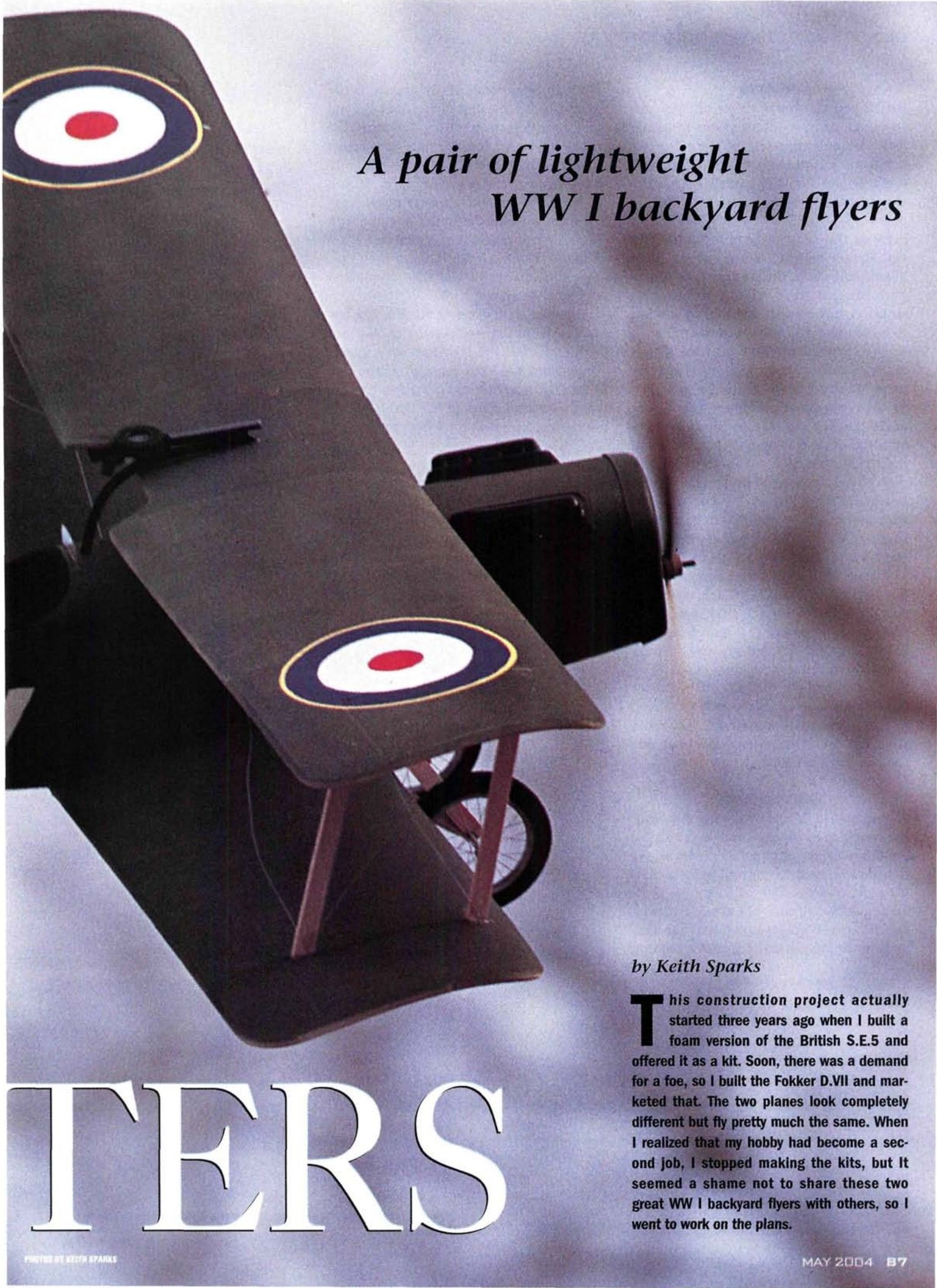
Your wing panels are now ready to be joined and/or attached to your model's fuselage and finished. With a little practice, you'll wonder why you were ever afraid to sheet wings!

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The DOGFIGH



A pair of lightweight WW I backyard flyers

TERS

by Keith Sparks

This construction project actually started three years ago when I built a foam version of the British S.E.5 and offered it as a kit. Soon, there was a demand for a foe, so I built the Fokker D.VII and marketed that. The two planes look completely different but fly pretty much the same. When I realized that my hobby had become a second job, I stopped making the kits, but it seemed a shame not to share these two great WW I backyard flyers with others, so I went to work on the plans.

PHOTOS BY KEITH SPARKS

TOOLING

Before you can build either of these all-foam models, you must build three hot-wire cutting tools, a wing cutting board and forward and aft fuselage cutting tools. To cut the wing panels, attach the wing templates to the ends of the cutting board. Place the 2-inch-thick foam block between the templates and make the first cut. Place a ¼-inch shim under the foam block, and make the second cut to produce the first wing panel. Continue this sequence three times. Use a ⅜-inch shim to make the wing center sections.

The forward fuselage cutting tool is really two tools in one. First, place the foam block between the outer templates on the cutting board and then, after you've made the first cut, replace the templates with the inner cutting-line templates, and then make the final cut to complete the part. The aft fuselage cutting tool is used in much the same way as the forward tool, with the exception that only one end template is used. The other end is held stationary to form a tapered section.

To cut the flat fuselage side panels, the tail feathers and the wing jigs, make the patterns shown on the plans, and use them to cut parts out of 2-inch-thick blue foam. Suspend the cutting wire ¼ inch above the tabletop with brass tubes. Slide the heated wire through the shaped foam to make as many parts as you want. Alternatively, to save material, you could slice the foam into sheets and cut out each part individually.

CONSTRUCTION

To prepare the parts for construction, trim the wing panels to shape and sand a radius around the wing edges and tail feathers. Do not sand where the wing will be bonded to the wing center section or where the vertical fin will be glued to the fuselage. Check the fit between the forward fuselage section and the aft tapered section; a little sanding might be required. Apply epoxy to the inner edge of one end of the fuselage, and then tape both sections together until the epoxy has cured (use very little.) If epoxy oozes out of the seam, clean it off with rubbing alcohol and a paper towel. If you don't, it will be difficult to sand off later. Glue the sides to the upper fuselage half. Note: make sure that the forward side edges are flush with the forward top section edge. Glue the area forward of the cockpit first and then the aft end.

Note for the Fokker D.VII: the last few inches of the tapered section should not be glued until the stabilizer is in place. Then bond the sides together at the tail. Install the seatback and instrument panel. Poke two small holes in the skin from the inside so you will know where to position the cockpit holes.

Wings. To assemble the wings, put their center sections flat on the table, and check the wing panels' fit to the center joint by supporting the wingtips above the tabletop (see the plans for the distance). The tops of the wing panels are bonded flush with the top of the wing center section.

specifications

MODELS: Fokker D.VII & RAF S.E.5a biplanes

TYPE: all-foam, WW I backyard dogfighters

WINGSPAN: 36 in.

LENGTH: 29 in.

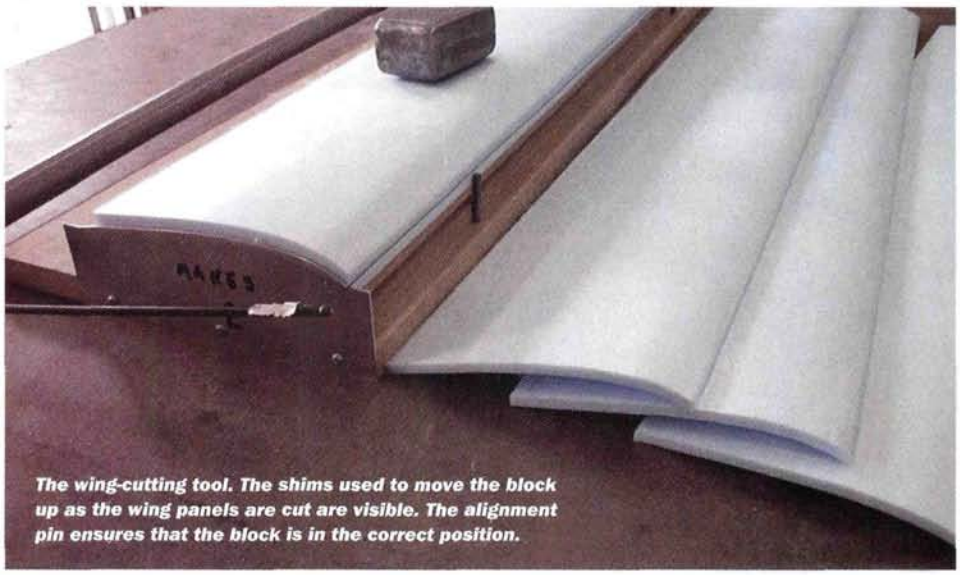
WING AREA: 455 sq. in.

MOTOR USED: GWS geared 350

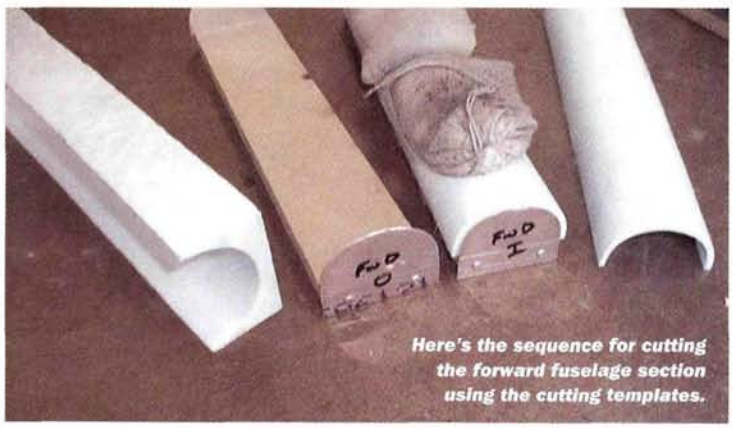
PROP USED: GWS EP 9x7

RADIO REQ'D: 3-channel (rudder, elevator, throttle)

COMMENTS: designed by Keith Sparks, these two biplane backyard dogfighters are based on simple scale Fokker D.VII and RAF S.E.5a designs. Construction is mainly of foam; the cabanes, interplane struts and landing gear are wood. A standard GWS power system and light electronics control these two great flyers. The plans have detailed drawings for the hot-wire foam-cutting tools and templates required to form all the parts needed. Formed plastic parts are available from the author at sparky2@alt.net.



The wing-cutting tool. The shims used to move the block up as the wing panels are cut are visible. The alignment pin ensures that the block is in the correct position.



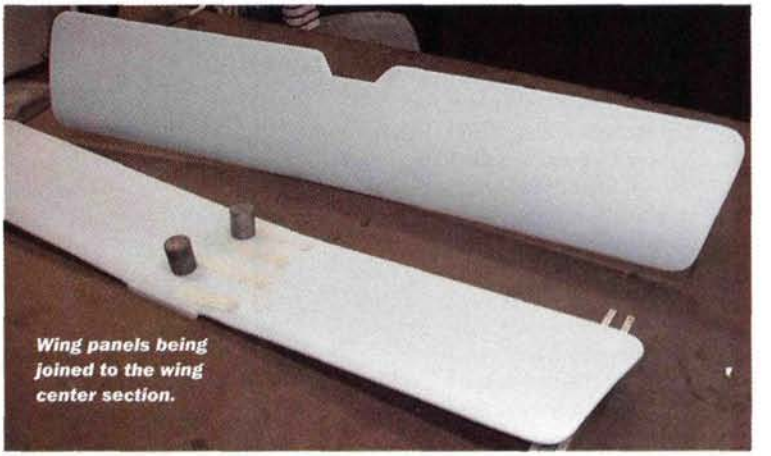
Here's the sequence for cutting the forward fuselage section using the cutting templates.



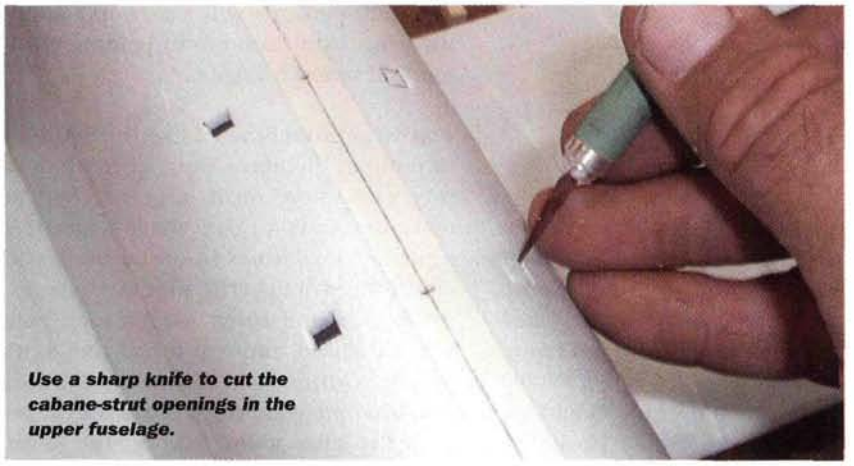
The aft fuselage section requires only one cutting template to form its tapered shape.



The model's parts, ready for assembly.



Wing panels being joined to the wing center section.



Use a sharp knife to cut the cabane-strut openings in the upper fuselage.



The cabane struts cross one another and are glued into place as shown here.

Apply epoxy to the edges of the wing panels, and hold them with tape until the epoxy has set. Do not worry if the panels droop when the support is removed. With the bottom wing flat on the table, test the fuselage-to-wing fit. Then draw a centerline on the lower wing center section. On both sides, measure out from the centerline 1½ inches and draw two more lines. This is where the outer edge of the fuselage will be bonded to the wing. The distances from each wingtip to the tail should be equal as should the distances from the wingtips to the sides. Now bond the fuselage to the wing using the lines you drew to position the pieces.

Cabane struts—S.E.5a only. Refer to the plans, and lay out the cabane-strut exit points on top of the fuselage. Mark their locations by using the end of the cabane strut sticks to dent the skin. Use a new no. 11 X-Acto blade to remove the dented foam. This allows the cabane struts to enter the fuselage and to be bonded to the lower wing center section inside the fuselage. Sharpen the tips of the struts, and then push them into the openings in the fuselage. Push them halfway into the wing center section and through the areas where the sides meet the wing. To prevent them from going all the way through, support the wing center section while you push the struts in with your finger. The struts should touch where they cross. Apply epoxy inside the openings, install the struts, and epoxy them where they cross. Attach the wing jigs to the fuselage sides with tape, and then place a straightedge across them to mark the final strut trim line.

Stabilizers. Cut the elevator halves out of the stab, and notch them to fit the wooden joiner dowel. Lay the elevator assembly flat on the table and epoxy the dowel into place. Check that the hinge lines remain straight while the epoxy cures. Draw the hinge centerline, hold the elevator halves down on the edge of a table and, with a sanding bar, lightly sand the leading edges to form the required V-shape (see the details on the plans). Epoxy the balsa stabilizer spar to the stabilizer's trailing edge, and draw a centerline here, too. Cut the hinge slots on the centerlines. Dip just the tips of the hinges into epoxy, and then push them into the elevator hinge slots. Move the hinges into and out of the slots to spread the epoxy around, and then wipe off the excess epoxy. When the glue has set, test-fit the hinges in the stabilizer before you glue them into place; then assemble the vertical fin and rudder using the same method.

Tail feathers. Place the fuselage and the lower wing center section on a flat surface with the wing's leading and trailing edges touching the surface. To form the stabilizer slot, draw a line ½ inch below the fuselage side seams and parallel with the tabletop. Then make another line ¼ inch below it, and cut away the material between the lines.

Note: D.VII—cut ¼ inch off the bottom aft end of the upper tapered section to make a slot for the stabilizer.

Check the stabilizer alignment, and then epoxy it into place. Install the pull-pull control horns with epoxy.

Servo installation. Cut the cockpit hole using the pattern printed on the plans. Gently sand a radius around the cockpit hole. Cut the servo-mount block out of a solid block of foam that fits snugly under the cockpit opening. Cut the servo openings slightly too small so that the servos fit tightly. Connect the servos to the receiver and set the trims to neutral. Tie Spider Wire fishing line to the servo arms, allowing more than enough to reach the

flight performance



I flew the Fokker D.VII and then the S.E.5a on a warm morning with a very light wind. I hand-launched both models for their first flights, and when I felt familiar with them, I evaluated them.

Control response was very good, and the motors provided excellent vertical performance. With a fresh battery charge, top speed is impressive. I soon had both planes executing tight dogfight maneuvers.

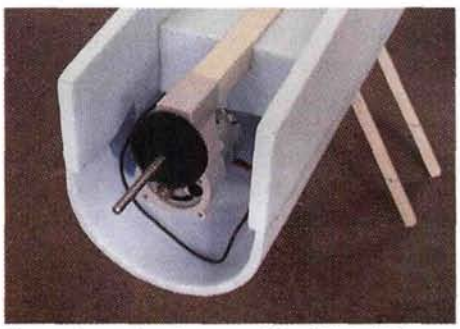
The Fokker seemed to be just a little faster than the S.E.5a, but not by much. I think that it's just a little less responsive to turn inputs, but it has great elevator control and can easily loop from level flight. Wow! What a cool thing to do for an hour or so on such a nice morning!

Battery power eventually started to drop off, so I began to set up for a landing. I pointed the Fokker into the wind, pulled the power back to almost nothing, and with just a very slight backpressure on the stick, it settled in nicely, level with the grass.

The hardest part of the day was waiting for the batteries to charge so that I could get both planes back into the air.

tail feathers. Epoxy the servo-mount block into the fuselage, being careful not to trap any wires or control lines. Route the antenna wire through the fuselage. Zigzag the antenna using tape to shorten it and reduce the length that hangs out at the back of the aircraft. Use a sharpened wire to poke holes in the fuselage where the aluminum pull-pull guide tubes will exit (see the plans for details). Slide the tubes into place and secure them with epoxy. Thread the control lines through the tubes and out to the control horns. Do not allow them to cross or touch one another inside the fuselage. Set the tension as evenly as you can, and then wrap the thread around the tip of the control horn and secure it with a small drop of CA.

Motor mount. Attach the motor to the motor-mount stick, and then use epoxy to secure the assembly in the slot in the motor-mount block. Trim the radiator out of the vacuum-formed parts, and slip it over the plane's nose to determine the prop shaft's position. Note: all vacuum-formed parts can be replaced with shaped foam. Mark the sides of the fuselage to show where the motor-mount block should go, and then epoxy the block into place. Use Velcro strips wrapped around the motor mount to hold the battery in place.



The motor and motor-mount-block installation.



The servos fit tightly in openings cut in the foam servo-mount block.

Use tape to hold the aft bottom fuselage sheet in position. Make sure the fuselage remains straight. The horizontal stabilizer should be parallel to the lower wing. Make any necessary adjustments, and then epoxy the sheet into place. Trim the rest of the vacuum-formed details, and glue them to the fuselage.

Note for D.VII: to install the motor detail, you must remove part of the upper fuselage section.

Now is a good time to paint the plane's base color; you can paint the markings later. I used Tamiya spray paint, but inexpensive water-based acrylic paint (thinned about 20 percent) will also work. Apply the paint with foam-rubber paint applicators and spread it evenly.

Top wing attachment. Use the wing jig to position the upper wing, center it, and then push down on its center section to make the dents for the cabane struts. Use a pin to poke holes in and around the dents; this will help the adhesive to bond. Apply a drop of epoxy around each hole you just poked, and return the wing to its proper position. Weight the wing down until the epoxy has cured. Place the model on a flat surface and support the lower wingtips 1½ inches from the surface, or, if you're building the D.VII, only 1 inch.

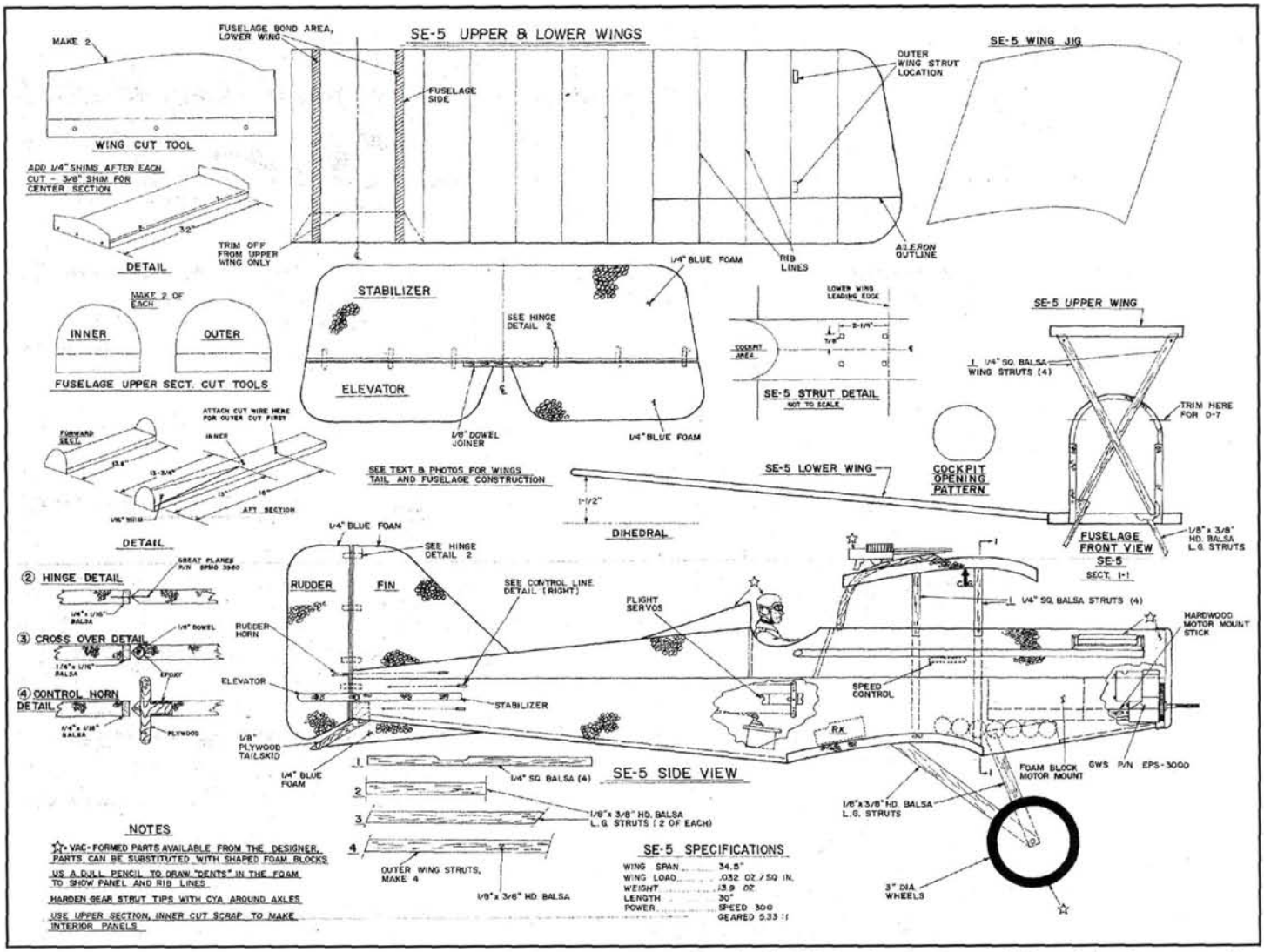
Put the wing jigs near the wingtips and tape them into place. Use the end of the wing strut to dent the upper wing at the attachment location shown on the plans. Then remove the dented area with a hobby knife. Slide the strut through the upper wing and make another dent in the lower wing. This should be deep enough to penetrate the surface but not deep enough to damage the lower surface. Support the



The painted fuselage with the wing-alignment jigs ready for the top wing's installation.



The inner plane struts are glued into openings cut in the wing panels.



To order the full-size plan, turn to page 148, or visit rcstore.com online.

bottom of the wing while you apply pressure to it. Mark the strut where it protrudes above the upper wing, and then cut it to length. Apply epoxy to the lower holes, and install the struts. To glue the upper struts into place, push epoxy into the space between the struts and the wing with a finger, and then wipe away the excess.

Landing gear. Epoxy the angled blocks to the fuselage sides just in front of the lower wing leading edge. Place the landing-gear struts over the plans, and bond them together with CA (make a left set and a right set). Drill a pilot hole for the axle, and then soak the area with CA to harden the wood. Mark the forward struts 3 inches from the axle holes. Position one strut so the mark is at the lower edge of the fuselage and against the inner landing-gear block. Rotate the strut aft until the end touches the lower wing center section, and press down on it to make a dent. Poke holes around the dent and then epoxy the strut end into place. Thread the axle through the struts, and then attach the other gear strut in the same way. Make sure that the axle is straight, and use your finger pressure to clamp it. Attach the axle to the struts with CA, and then install the wheels. (See my "How To" article on making light spoked wheels in the March 2004 issue.)

All that's left to do is to add the markings of your choice, check that the radio works properly and charge the batteries for your first flight.



Formed plastic parts for both models are available from the author.



click trip MODELAIRPLANENEWS.COM FOR MORE CONSTRUCTION INFO ON THE FOKKER D.VII

FLYING

Both Dogfighter models fly very well. At full power, the planes lift off in about 3 feet. For your first flight, use only ¾ power until you have a feel for the controls. Deadstick landings are a little hard on the wheels, so hold a little power in until you land.

Have fun!

GWS; gws.com.tw.
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PRODUCT REVIEW

by Gerry Yarrish

JR XP6102

A multifunction 6-channel programmable radio with a sport-flyer price!



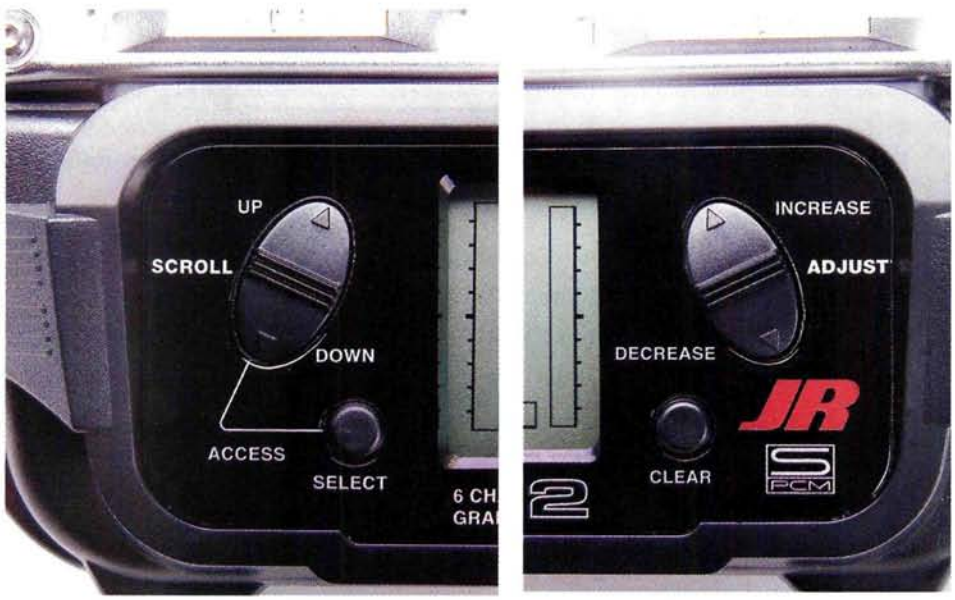
Have you ever wanted a full-feature programmable radio but just didn't want to commit to a 9- or 10-channel top-of-the-line system? High-end systems may be fine for dedicated, full-fledged competitors, but they are a big investment for average sport fliers who just want more versatility.

Enter JR: distributed by Horizon Hobby, the new 6-channel programmable JR XP6102 radio has a 10-model memory and features programming for airplanes and helis at a very attractive sport-flyer price tag. JR has taken the extra step to gather many great functions that, until now, haven't been available in a 6-channel RC system. Let's see exactly what the XP6102 has to offer.

FEATURES

With its wide-screen display, 10-model memory and user-assigned switch placements for specific functions, the JR XP6102 is a serious radio for the price. The transmitter fits nicely in your hands, and its user-friendly layout positions the dual rate, flap and landing gear switches in the upper right corner. The two inward-slanting Scroll and Adjust thumb switches located on either side of the main LCD screen are a departure from the several small adjustment buttons found on JR's previous radios. They give radio programming an entirely new feel; they're easier and more comfortable to use.

The two main control sticks, as usual, are adjustable in length, and the rudder, throttle, aileron and elevator tension can be fine-tuned. The XP6102 also includes direct servo control (DSC), so you can adjust your model at the field without transmitting a signal. The radio frequency is selectable for either pulse-code modulation (PCM) or pulse-position modulation (PPM)—often referred to as standard FM.



All data entry and menu navigating is handled by these four thumb switches. The positions of the switches make programming very easy.

The standard system components include the transmitter, an R770 (PCM) or R700 (FM) receiver, an airborne 1100mAh Ni-Cd battery pack and charger, NES 537 servos (four for airplane and five for heli), a 12-inch aileron extension, a standard switch harness with a charging jack, servo mounting hardware, a hex-wrench and the instruction manual. For those who prefer it, a base-loaded transmitter antenna is also available. Features of the XP6102 include:

- **PCM throttle fail-safe.** The radio comes set with the throttle programmed to go to idle if the signal is lost.
- **Servo-travel display.** This helps to sort out the various servo positions and is very helpful when checking out your program mixes, functions and proper direction and control throw settings.
- **Assignable switch placement.** Start with the preset positions, and then adjust them to your liking.
- **On-screen offset mix point adjust.** You can dial in the offset points for various channel-mixing adjustments while looking at the graphic display.
- **5-point graphic display.** This screen in the heli system allows simple pitch- and throttle-curve adjustments.

The owners' manual is very well illustrated, and it includes all the programming information needed for the airplane and heli systems. The flow charts for the System and Function modes are shown (pages 19 and 31, respectively), and each category is highlighted with page numbers

to direct you to more detailed explanations of the settings and adjustments.

INPUT AND DISPLAY

The Scroll key allows you to move through the various program functions while the Adjust key increases and decreases selected function values; the Select key is used to advance the channel and select function. When you turn on the transmitter, the Normal mode display includes the model number, model type, model name, modulation type, how long the transmitter has been on and graphic representations of the digital throttle, rudder, aileron and elevator-trim settings. If you press the Scroll Down function and the Select keys and then turn on the radio, you are able to enter the System mode.

The Airplane System mode flow chart includes model selection, wing type, switch select, trainer settings, modulation type, model copy, model type and model name entry. When you reenter the System mode, the display shows the last program selected.

Pressing the Scroll Down and Select keys while the radio is already on calls up the Function Mode flow chart. The Function flow chart includes Dual Rate and Expo, Servo-Reversing Switches, Sub-Trim, Travel Adjustment, Ele->F mix, Ail->Rud mix, Throttle Cut, Flap System, Program Mixes 1 through 4, Fail-Safe and Servo Travel.

The Scroll key takes you through the selected flow charts. Once the appropriate





The standard airborne pack includes a PCM R770 (or a standard FM R700) receiver, a large-capacity 1100mAh battery pack and 4 or 5 NES-537 servos.

XP6102 HELICOPTER FEATURES

Not only is the XP6102 an exceptional airplane computer radio, but it's also a low-cost system with practical, versatile features that are ideal for heli pilots. A quick look at the heli programming shows just how much JR has packed into the software, and after you scroll through the menus, you'll easily see that ease of use was a high priority.

The XP6102 is a multifunction radio system; its programming is divided according to model type (airplane and heli), and its functions are split in two modes: System and Function. System mode includes basic programming items such as model selection, type, name and switch assignments, modulation and swashplate types. The Function mode handles the bulk of the programming: pitch and throttle curves, servo-reversing, travel adjust and all other heli-related programming are input with just a push of a button.

I had a chance to run through the various menus, and without referring to the manual, I was able to figure out most of the programming. The XP6102 offers two programmable mixers that allow you to mix any one channel with any other channel. The mix can remain on at all times or be switched on and off during flight. There are three pitch curves (normal, stunt and hold) and two throttle curves (normal and stunt) available, and they are represented as graphs on the ample LCD screen. Each curve has five adjustment points and will suit the needs of all but the most demanding heli pilots. To accommodate today's heli cyclic collective-pitch mixing (CCPM) control systems, the XP6102 has three CCPM variations: 2 servo—180 degrees,



3 servo—120 degrees and 3 servo—90 degrees. Standard mechanical mixing is also supported.

JR has come up with a radio to suit all heli pilots. The XP6102 offers four flight modes with 5-point curves and digital trims and programming that's intuitive—a terrific choice for your first computer radio. The manual is easy to understand and does an excellent job of walking you through all of the radio's functions with step-by-step instructions supplemented by clear drawings. The JR XP6102 is a great value for all heli pilots.

—Rick Bell

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SPECIFICATIONS

TRANSMITTER	
Type	X-6102A (airplane), X-6102H (heli)
No. of channels	6
RF Module	72MHz
Modulation	FM (PCM or PPM)
Output power	750mW
Current drain	200mA (70mA with DSC)
Power source	9.6 volts (600mAh)
RECEIVER	
Type	PCM R770 7-channel/micro
Frequency	72MHz
Weight	1.5 oz.
SERVO	
Type	NES-537
Torque	43 oz.-in.
Speed	0.25 sec./60 deg.
Weight	1.58 oz.
Ball bearings	Single
Motor	3-pole ferrite
Dimensions	1.52x0.73x1.32 in.
BATTERY	
Type	Ni-Cd
Capacity	1100mAh
Voltage	4.8 (4 cells)
Weight	4.9 oz.
PRICE	
$269.99	(Airplane w/R770 PCM receiver, 4 NES-537 servos or Heli w/R700 receiver, 5 NES-537 servos)
$249.99	(Airplane w/R700 standard FM receiver, 4 NES-537 servos)
$289.99	(Heli w/R770 PCM receiver, 5 NES-537 servos)

Features: 6 channels; 8-character model naming; selectable for PCM and standard FM modulations; selectable switch locations; trainer and pilot link systems; sub-trim adjustment; travel adjustment; servo-reversing; dual rate/expo for aileron, elevator and rudder; digital trims; throttle-cut system; fail-safe system (only in PCM mode); servo-travel screen; model copy; ergonomic case with soft-rubber side panels; adjustable stick length; 10-model memory; programming for aircraft and helicopter; 5-year lithium battery; Direct Servo Connect (DSC), large LCD screen.

Airplane mixing: flaperon, elevon and V-tail; flap system with elevator trim; elevator-to-flap; aileron-to-rudder; 4 separate programmable mixes.

Heli mixing: 5-point throttle and pitch-curve adjustment; normal and stunt curve adjustment; revo mixing; two separate programmable mixes and CCPM swashplate mix for 3-servo, 90-degree mix; 3-servo, 120-degree mix; 2-servo, 180-degree mix variations.



On the upper left corner are the elevator dual rate (face), gear switch (top), the trainer button and the flap/hover pitch lever.



The upper right corner is home to the aileron dual rate (face), flap switch (top), throttle-cut button and rocker/hover throttle lever.

function is displayed, use the Select and Increase/Decrease keys to make changes.

For quick access to the various screens, turn the radio on and then hit the Scroll Up and Select keys at the same time. You can then navigate through the list and press the Scroll Down and Select keys at the same time to enter the menu that you have selected. Again, the ease with which you can move into the various menus is welcome.

SWITCH SELECTION

Several options are available for the dual-rate, landing-gear and flap switches. The aileron and elevator dual rates can be programmed to be activated with their own switches with "Individ," or the aileron, elevator and rudder rates can be combined so you can turn them all on using one of four switches or rockers. The Flap and Gear channels can also be programmed to use one of four switches. To allow the Gear channel to be used as a slave channel for mixing, it can be set to "Inhibit" so that none of the switches can activate it.

THROTTLE CUT

This function assigns the throttle-cut point with the push of a button. With this feature, you are able to leave your throttle-trim setting at the best idle position and then use the button to close the throttle completely to kill the engine. You can inhibit this function or select the cut point from -32 to -128 percent.

SERVO-TRAVEL DISPLAY

Borrowed from the popular JR 8103, this display gives a graphic representation of servo travel, centering, trim and direction



Top left: when you turn the radio on, the main information display shows the model number, model type and name, the battery voltage, the modulation type, the internal "radio on" timer and a graphic display of the rudder, throttle, elevator and aileron digital trim positions.

Top right: when you switch to the Function mode (by simultaneously pressing both the Down and Select keys), one of 11 function screens is displayed. Here, the Dual Rate/Expo screen shows the settings for the aileron channel. Note the graphic exponential display to the right.

Lower left: the Fail-Safe/Hold function screen is very easy to understand. With the function activated, you can set the assigned channels (throttle, rudder, elevator, flaps and ailerons) to hold their last positions (HLD), or you can adjust each one for a specified servo position. The screen shows that all the channels are on servo hold except for throttle. The linear graphic display indicates a specified throttle servo setting.

Lower right: with its moving arrowhead indicators, the Servo Travel screen is a helpful way to verify the transmitter's stick movements. It can also be used for visual confirmation that your mixing functions are properly assigned without your having to turn on your aircraft.

AFTERMARKET AIRBORNE ADD-ONS

JR AIRPAC 5

With the versatility of a 10-model memory, the XP6102 is ideal for modelers who want to outfit several models with separate flight packs; it's much more convenient than switching radio systems and servos between various models. Priced at $144.95, the JR AirPac 5 has a 3-year warranty and is a good way to get everything you need in one package. Included are five NES537 ball-bearing servos, a R700 FM 7-channel receiver (crystal required), a small switch harness with charging jack, a 12-inch aileron extension and a large-capacity, 1100mAh Ni-Cd battery pack.



The JR AirPac 5 is a good way to outfit extra models without your having to buy an entirely new radio system. With the XP6102's 10-model memory, you'll be able to use several additional flight packs.



The standard FM R700 receiver is also available. Both types of receiver use the interference-protection circuitry.

SLIMLINE R700 RECEIVER

The new JR Slimline R700 FM receiver replaces the popular R600 and is the new baseline FM (PPM) aircraft receiver. Not only does it have one more channel than the R600, but it's also smaller and weighs less. Like all JR FM receivers, the R700 features JR's patented interference-protection circuitry and is compatible with all current JR FM aircraft systems.

SPECIFICATIONS

Modulation	FM
Frequency	Available in 72, 50 and 53MHz
Weight	0.64 oz.
Dimensions	0.61x1.84x0.98 in.
Price	$79.95

of travel in a six-line display. This screen is helpful when you try various mix adjustments and offers a quick way to get set up and in the proper range.

DIRECT SERVO CONNECTOR

With this feature, you can operate servos directly from the transmitter without turning it on. This is especially useful at events to make programming changes without causing frequency conflicts.

PCM FAIL-SAFE

Another useful feature is the transmitter's Fail-Safe/Hold function. Active only in the PCM modulation setting, this function allows the servos to hold their positions if the transmitter signal is lost or to default to a predetermined setting. All six channels can be set, and the display makes adjusting the servo positions very easy. First you activate the various channels with the Select key, and then you use the control sticks to position the servos. When you have the controls where you want them, simply press the Clear button, and the positions are set. Quick and simple!

JR has always had a reputation for making great radio gear, and the XP6102 continues this tradition. Once you've tried it, you'll wonder why all 6-channel radios don't have the same great features. It's sure to become a very popular choice among RC pilots, regardless of what they fly! ✈

JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

Add muscle to your WattAge MiG



I'm an avid modeler, and sometimes, I just can't leave well enough alone. For example, my all-foam WattAge MiG 15 is a great flying electric ducted-fan (EDF) jet that uses the included 400-class can motor and a WattAge PowerFan unit. But I wanted more—more speed, and the faster the better! After all, it's a jet!

I decided to look at various power options and fans that would be compatible with the MiG. In this article, I highlight how I modified the model and made it even more of a blast to fly.

GETTING STARTED

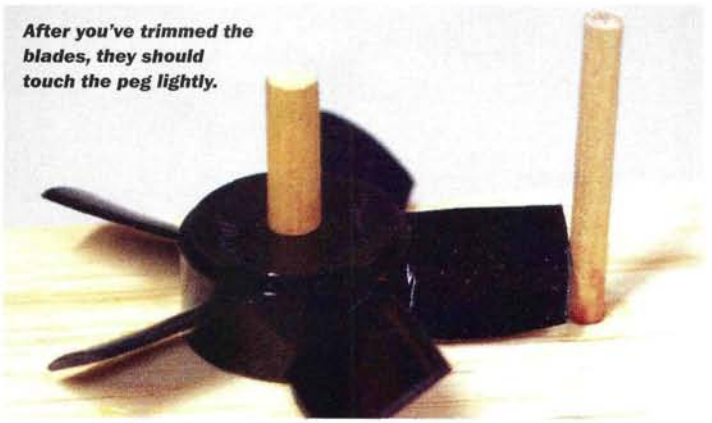
Before I started to build the MiG, I made a short list of things that I wanted to change; these included increasing its power output, enhancing the airflow to the ducted fan and strengthening the airframe to handle the increased flight loads that will be placed on it.

POWER SYSTEM

First up was the ducted fan. The stock WattAge unit provides ample thrust for the MiG and takes well to being modified. I fitted a Mega 16/15/3 brushless motor instead of the included 400-class brushed motor, and I was pleasantly surprised that it fit perfectly in the fan shroud. I understand that an AstroFlight 020 brushless will also fit. Next, I replaced the stock impeller with a Kyosho impeller from



The Kyosho impeller on the go/no-go gauge; the blade is clearly too long.



After you've trimmed the blades, they should touch the peg lightly.

Kyosho's FV-1000 model. There were two problems with it: its diameter was larger than the WattAge impeller, and it wouldn't fit inside the fan shroud; I needed an adapter to make the impeller fit on the Mega motor. Luckily, the adapter from the FV-1000 also fits the Mega brushless. Had I decided to stick with the stock impeller, WattAge sells an adapter (item no. 131332) that fits the Mega perfectly.

Modifying the Kyosho impeller was easy to do. I made a simple go/no-go gauge to accurately measure the blade's length. My gauge is a block of wood with two pegs—one to hold the impeller and one to set the blade's length. After determining the blade length needed, I placed the outer peg the required distance from the center peg. I cut down the blades and placed the impeller on the gauge. When the blades hit the outer peg, they are too long and need to be trimmed further. When the blades just lightly rub the peg, they're the correct length. I then used a Robart High Point Balancer to balance the modified impeller. Before installing the fan unit in the model, I did a few tests to establish a performance baseline. See the "By the numbers" sidebar for the results.

BUILDING THE MIG

Having set the power system, I was able to build the airframe by following the kit's instruction manual. The model is quick and easy to build, but I was concerned about the airframe's strength in two areas: the wing panels are butt-glued to the fuselage sides, and a thin fiberglass plate is glued to the bottom of the panels and into the fuselage. I felt this wasn't enough support and added 3/32-inch dowels at the wing's leading and trailing edges. The dowels extend into the wing and the fuselage for a few inches. This would stop any flexing.

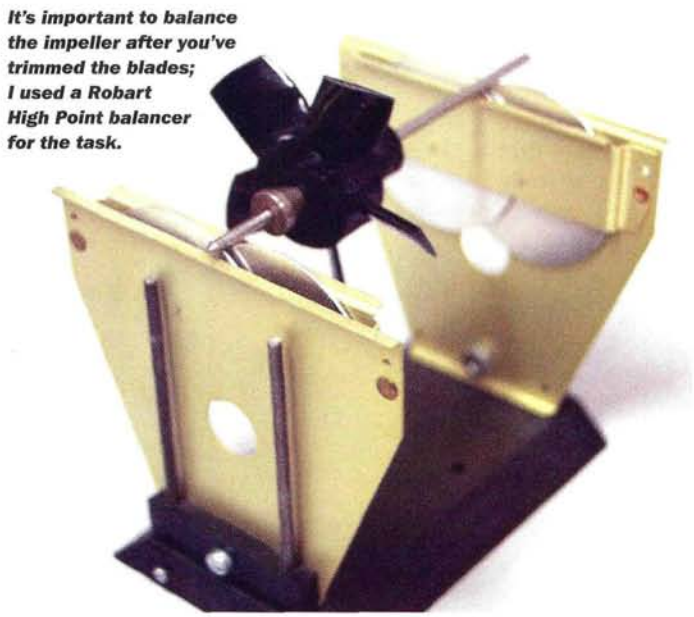
The horizontal stabilizer is no more than a sheet of thin foam and is pretty flexible. To stiffen it, I epoxied a strip of carbon-fiber tape to its underside. This tape is from Hobby Lobby, and it's 0.007-inch thick (about the same thickness as a playing card) and 0.5 inch wide. It adds hardly any weight and significantly stiffens the stabilizer. The rest of the model went together without a hitch.

To personalize the MiG and make it easier to see when it's flying, I used Tamiya Silver Leaf on the fuselage and wing and Tamiya Red paint on its tail. If you use paint on the model, make sure that it's safe to use on foam and apply it in light coats. You can quickly add a lot of weight if you use too much.

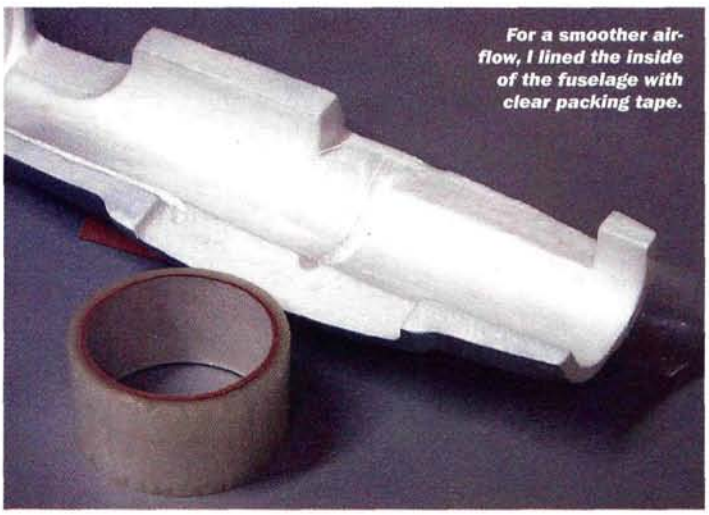
IMPROVING THE AIRFLOW

To get the most performance from the ducted-fan unit, you must make sure that it can efficiently draw in large volumes of air, accelerate it and push it out through the rear of the model. On the MiG, air enters through the nose and travels two-thirds of the length of the fuselage to the ducted fan. Before joining the fuselage halves, I lightly sanded the airway to smooth it, and then I lined it with clear packing tape. This smoothes and speeds up the airflow.

To allow more air to enter the ducted fan, I reshaped and streamlined the cheater hole to maximize airflow. I chamfered the front of the cheater hole and ramped it into thefuselage.This increases the airflow and eliminates turbulence.



It's important to balance the impeller after you've trimmed the blades; I used a Robart High Point balancer for the task.



For a smoother airflow, I lined the inside of the fuselage with clear packing tape.

Another way to enhance performance is to attach a foam or thick paper cone to the rear of the motor to help smooth out the exiting air. You can easily tape a cone to the motor.

MISSION READY

The speed increase is dramatic! The MiG now cruises around at ¾ throttle and effortlessly loops from level flight. The model feels more solid on the controls, and with the rpm increase, it sounds very cool. I've been using a 10-cell, WattAge 1100mAh NiMH battery (item no. 128552). It's configured to fit in the MiG's battery box and costs only $37.



I added dowels to the wing/fuselage joints to strengthen them. The dowels extend several inches into the wings and are plugged into the fuselage.

DEBRIEFING

This is one project that I enjoyed a lot. If you want to try an EDF model, the WattAge MiG 15 offers a great way to get started. Its performance with the stock setup is pretty good, and it flies well. If you really want a jet that cranks, however, a brushless motor is the way to go. You can use the WattAge impeller with the Mega motor and still make significant performance gains without the other modifications. The Mega motor works impeccably and will provide many hours of flight time over MiG Alley. Give one a try and have a "jet blast"! ✈

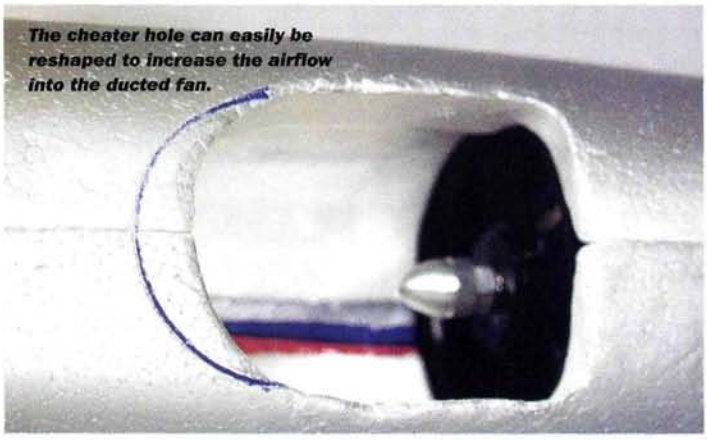
BY THE NUMBERS

To see how much difference changing the motor and impeller would make, I hooked the kit-supplied motor and impeller up to an AstroFlight Whattmeter to establish baseline performance numbers. I then ran the test again with the Mega brushless motor and WattAge impeller; last, I tested the Mega with the Kyosho impeller. I did this with a 10-cell, 1100mAh NiMH battery. As indicated by the numbers in the chart, the increase in performance was dramatic.

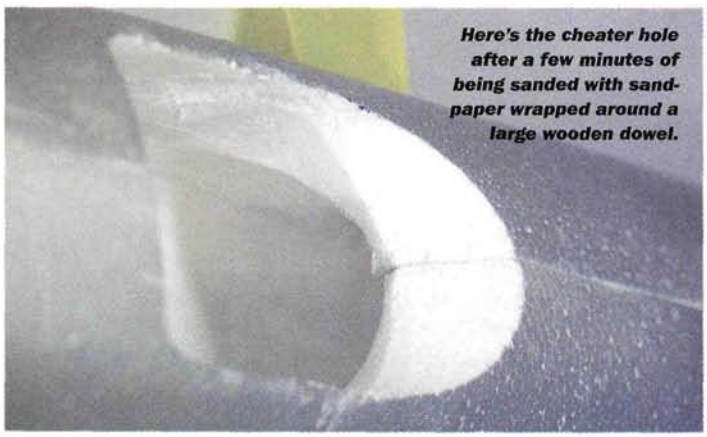
Motor/Impeller	Draw (amps)	Watts	Thrust (oz.)
S400-class/WattAge	8.5	120	8
Mega/WattAge	13	135	11
Mega/Kyosho	16	165	16

Changing only the motor increased the thrust by nearly 40 percent. The biggest gain, however, was achieved with the Kyosho impeller mated to the brushless motor; with these, thrust was doubled.

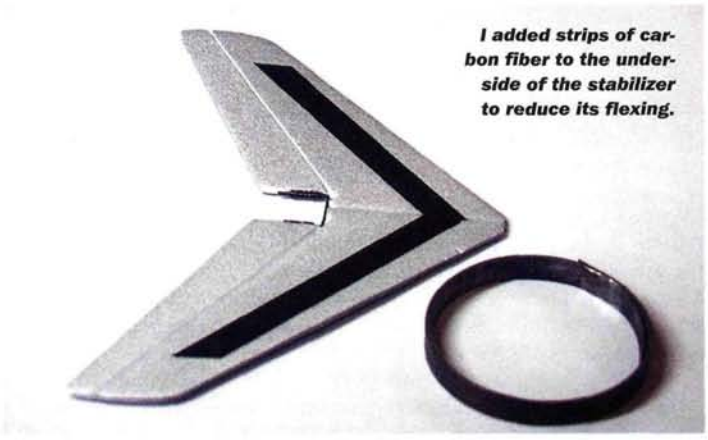




The cheater hole can easily be reshaped to increase the airflow into the ducted fan.



Here's the cheater hole after a few minutes of being sanded with sandpaper wrapped around a large wooden dowel.



I added strips of carbon fiber to the underside of the stabilizer to reduce its flexing.

AstroFlight Inc. (310) 821-6242; astroflight.com.
Mega Motors; distributed by Hobby Lobby Intl.
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Kyosho; distributed by Great Planes Model Distributors (217) 398-6300; (800) 682-8948; kyosho.com.

Classic Model Airplane News

by Matt Boyd



50 years ago...

Adorning our cover 50 years ago this month, Jo Kotula's rendition of a WW I action sequence featured a French Spad (arguably the most capable fighter of the Great War) downing a German opponent. Check out that artistry; they don't make 'em like the Spad—or like Jo—anymore!

On the technical side, if you were building a small model back in '54, your choices of lightweight covering were pretty limited. Microfilm was a popular choice even back then, and contributor John Zaic showed readers how to make their own. The process involved pouring a pyroxylin solution onto water and retrieving the film it formed with a wire hoop.

The "R" in RC was relatively new in 1954, but radio equipment was becoming more reliable, and *Model Airplane News* was quick to point out the advantages of having "C." It did require more diligent preflight inspection (especially in those early days), and we ran through some of the basics that yielded more consistent control.

25 years ago...

The pages of the May 1979 issue were filled with a number of kit reviews and construction articles, not to mention a few RC boat and car features (spin-off publications *RC Car Action* and *RC Boat Modeler* were still years away). The cover plane was the Bud Nosen Citabria, a 105-inch-wingspan "Airbatic" trainer that was reviewed by Darrell Wong. We also ran a feature by Dr. John Mountjoy on using mufflers for noise reduction and their effects on power. Though there was debate at the time, can you imagine running a nitro engine with an open exhaust today?



As interesting as the articles in these classic issues, are some of the ads. Check out the full-page ad for the Futaba FP-3S radio. Transmitters sure have come a long way in 25 years



10 years ago...

Our cover plane for the May 1994 issue was Midwest's 1.20 AT-6 Texan (you can just make it out behind all those cover lines!). The big news, though, was the debut of Saito's big FA-150S 4-stroke. At the time, it was the biggest hobby 4-stroke single on the market, and engine ace Mike Billinton went over it, top to bottom and inside out. The engine remains a staple among giant-scale enthusiasts even now, 10 years later.

The May '94 issue also featured one of the first examinations of a brushless motor installation and the performance potential that this emerging technology offered. Aveox's 1412/7 really gave the MAP Aura 2 sailplane wings when it produced the fantastic performance and duration that we have since come to expect from brushless setups.



Finally, to satisfy truly committed scratch-builders (or maybe just those who needed to be committed), we published Joe Lukins' "how to" on building retro fuel tanks out of sheet brass! Though not for the faint-hearted, this article covered all the essential tools and techniques necessary for those for whom a store-bought tank just wouldn't do.

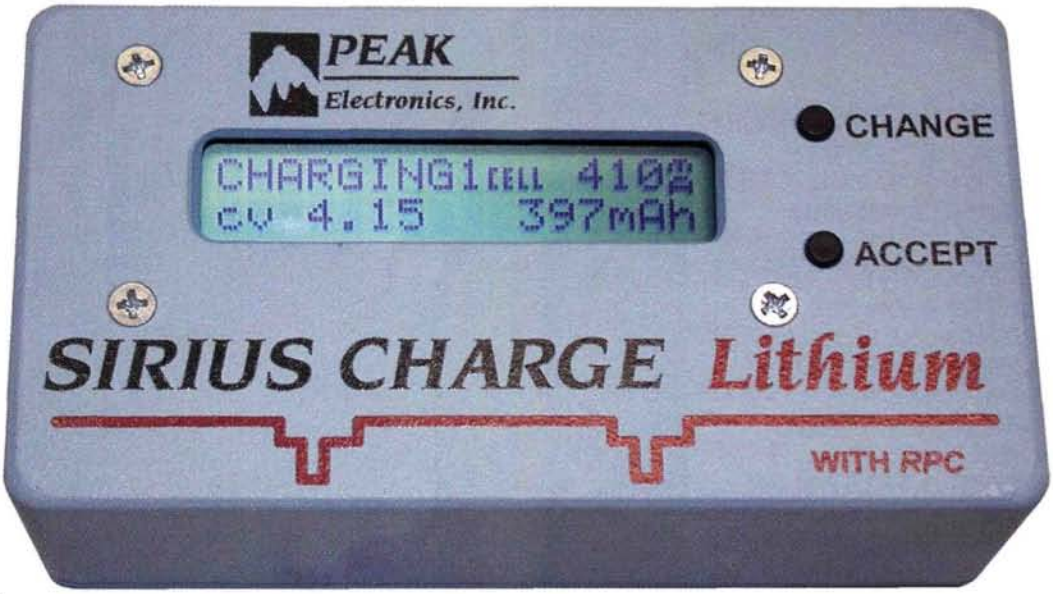
AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

PEAK ELECTRONICS INC.

Sirius Charge Lithium

Dependable and easy to use

The new Sirius charger can charge 1, 2, or 3 Li-poly or Li-ion cells. Discrete charge-current levels can be set for 50, 100, 150, 250, 500, 750, 1000 and 1500mA. You manually set the number of cells and the charge current (rounded to the nearest 10mA), and an LCD screen indicates that information and the capacity going into the battery (measured to the nearest mAh).



This very compact unit has a 24-inch input power cable that terminates in two banana-type plugs. The 34-inch output cable comes with a standard Futaba "J"-style female connector. The input power requirement is 12 volts DC at up to 2 amps. This can be obtained from a 12V car battery or an AC-operated, 12V DC supply with low ripple output. Interestingly, the Sirius Charge has a voltage-boost circuit that ensures that a 3-cell battery can be fully charged from an input voltage as low as 10 volts. The Sirius will draw 1.7 amps off a 12V DC source when charging a 3-cell Li-poly or Li-ion battery at the maximum 1500mA current.

Once you establish a cell count and charge current, those settings will remain in the unit's memory until you turn the input power off or manually change them to other values. So, after a flight, if you return to the Sirius Charge with the same battery, the settings will be correct.

The Sirius Charge has a safety feature that prevents battery damage if you select the wrong cell count; for example, if you select 3 cells and then connect 1 or 2 cells, it will not charge them! It is also "goofproof" in the sense that you can't harm the charger or batteries if you plug anything in backward. Also, as a bonus, if you set the Sirius Charge current to the "Off" position, you can use the charger as a general-purpose voltmeter. It reads between 0.5 and 12.7 volts.

I found the new Sirius Charge an easy-to-use unit that operates in a very repeatable and dependable manner. After several weeks of charging and then discharging with my bench-test equipment, I found that the input/output numbers always checked out. It costs $149.95. —*Bob Aberle*

Peak Electronics Inc. (858) 679-4952; siriuselectronics.com.



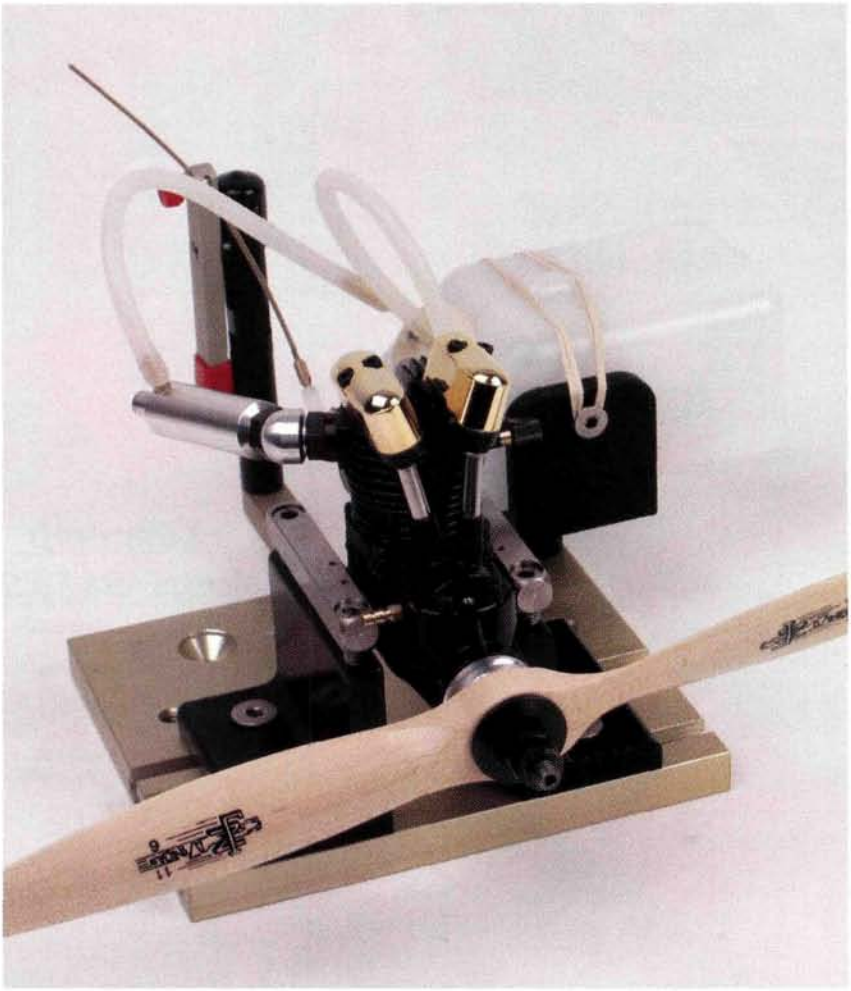
AIRTRONICS

Anodized Stick Ends

Transform your transmitter

Now you can personalize your transmitter with the new Anodized Stick Ends available from Airtronics. Yeah, I know they're just a little radio add-on, but they make such a big difference in your transmitter's looks that you will be surprised by how many people ask you whether you just bought a new radio! They'll also really make your transmitter stand out in any radio impound area. The extensions have a nice, solid feel and are designed not to slip off your fingers. Available anodized in red, blue and gold, they come two to a package for just $16.95. —*John Reid*

Airtronics (714) 978-1895; airtronics.net.



PSP MFG.

Engine Break-In Stand

A versatile, high-quality aid

One of the best things you can do for your new engine is to break it in properly. A properly broken-in engine will run better for longer and with fewer problems. You could break in your engine on a newly built plane, but that plane will look as if it has a dozen flights on it before you unveil it at the field. It's much better to break an engine in before you install it and to do it on a test stand such as this one from PSP Mfg. The $87.99 PSP Mfg. stand is made of aircraft aluminum and has stainless-steel components, so it's durable and easy to clean. A 10-ounce fuel tank with a filtered clunk, a throttle arm with a wire cable, a ball connector, a hex wrench and four mounting screws are included. A powder-coated steel mounting post is available separately for $52.99. Because part of the post is inserted 24 inches into the ground, the stand's top plate is at a good working height; the plate has four tapped holes that allow the engine to be mounted on it.

The stand is adjustable and can safely accommodate .049 engines and larger—all the way up to the SuperTigre 4500. With the optional $29.99 back mount adapter, it will accept even 150cc gas powerplants. Clamp the engine to the stand with two 3/8-inch steel bars, and it will not move. Safety is what this test stand is all about: the throttle-control lever is at least 8 inches behind the prop. The fuel tank is also well behind the prop, so it's easy to stop the engine by pinching the fuel line. If you want a break-in test stand, this is the one to get. *—John Reid*

PSP Mfg. (866) 622-6566; pspmfg.com.

A&A ENGINEERING

Smart Battery Charger

No tuning or adjusting needed!

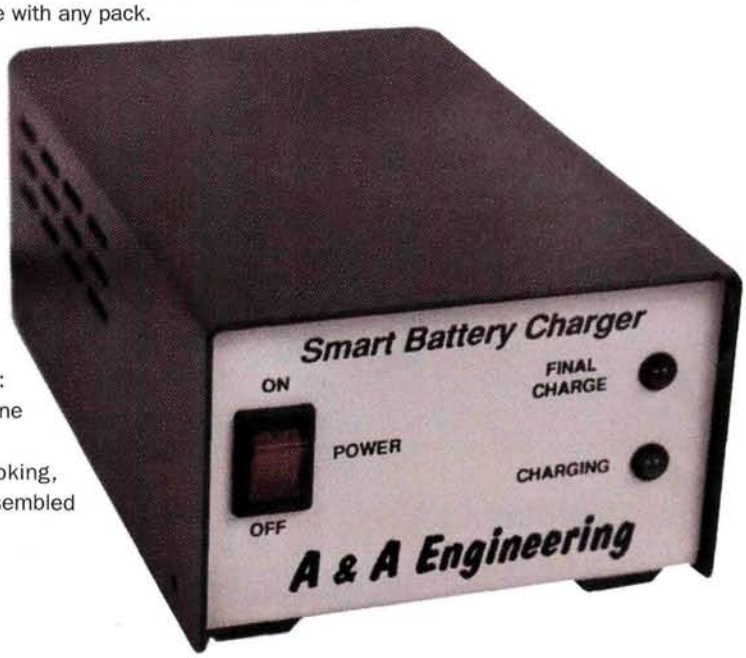
Unlike many chargers, this is not a general-purpose device but is designed specifically to charge lead-acid batteries, and it has all the control and sensing functions you need to get the most out of your batteries. It requires a DC power source and only a few external components to tailor it for use with any pack.

The Smart Battery Charger revives a sealed lead-acid battery in three stages: "bulk," "absorption" and "maintenance." In RC speak, this means initial charge, topping off and trickle-charge. The charger senses a pack's condition and supplies only the charge necessary to bring it up to maximum capacity. It switches to a trickle rate at which the battery can be charged indefinitely without risk of damage.

Tinkerers will be happy to learn that the A&A charger is available not only assembled and tested but also in kit form. Its few parts are not particularly difficult to assemble, the component board is not at all crowded, and the instructions are clear and concise. If you can solder and follow instructions, you can easily assemble this charger. The instructions are somewhat reminiscent of the old-timer Heathkits: "Cut the red wire to 2 inches long; remove 1 inch of insulation from one end and solder to …." Piece of cake!

The A&A Smart Battery Charger kit includes a professional-looking, painted and prepunched, silk-screen cabinet and costs $59.95. Assembled and tested—$79.95 (S&H in U.S.—$7.50). *—Eloy Marez*

A&A Engineering (714) 952-2114; a-aengineering.com.



by George Leu

Team Scale



Here's a good team: builder Henry Haffke (right) and pilot Nick Ziroli Sr. pose with Henry's new Gee Bee Model-A biplane. Henry's construction article for this unusual model will be featured in the June 2004 issue of Model Airplane News.

A great way to get into competition

Toward the end of last year, I teamed up with my good friend and *Model Airplane News* senior tech editor Gerry Yarrish, and we headed off to the New England Scale Championships and Masters Qualifier in Gardner, MA. I had been out of competition for a while and wanted to become more active. I didn't have a competition-worthy airplane, and Gerry offered his nicely done Piper L-4 Grasshopper, which he built from a modified Balsa USA kit for me to fly in the Team Scale category. Gerry also competed in Fun Scale with a relatively simple Hangar 9 Super Cub. There just isn't a nicer way to spend a weekend than flying scale with a friend.



This B-17 "Nine O Nine" was built by Mitch Epstein who flew it in Expert. As impressive as multi-engine models are, they really aren't a good choice for your first time in competition. Pick something simple!

TEAMWORK!

Team Scale offers a great way to start competing because it allows a model builder to have someone else pilot his plane, and they form a team. First introduced in the early 1980s, Team Scale caused quite an uproar in the scale community. Until then, the builder and flier had to be the same person. Initially, there was little participation, but as scale models became more sophisticated, builders spent more time building and less time flying. Soon, it was obvious that there are many good fliers and many good builders but few good builder/fliers.

Today, team scale is an integral part of scale competition and a great way to bring new faces into events such as the U.S. Scale Masters, the AMA Scale Nationals and the Top Gun Invitational competitions.

Here are more reasons why I like Team Scale competition:

1. The builder and pilot form a partnership.
2. The two work together to show their strongest skills and to show off the model's best attributes.
3. Because it involves two people, it better promotes interest in scale modeling activity.
4. Working as a team eases the pressure of competition.

EVALUATION

Prior to our team effort at the qualifier, Gerry had competed in the Expert Scale category with the L-4, and I had flown his model on numerous occasions but never in competition. When you fly a plane



Many WW I models like this Siemens Schuckert built and flown by Dave Johnson, show up in scale competition. If you are a better builder than you are a flier, there's nothing wrong with producing a great WW I biplane like this and then teaming up with a better flier for Team Scale. You'll both have fun!

for fun and then decide you want to fly it competitively, the aircraft seems to become a different machine. So that I could get a better feel for how his model flew, we met several weeks before the competition and discussed its finer points. We came up with a list of maneuvers, and then we went to the flying field and test-flew the model to decide on the best flight sequence. We tried to fly each maneuver in exactly the same way every time. You don't want a particular maneuver to be successful 90 percent of the time; you jeopardize your flight scores if that's the case. You want 100-percent success. For example, the L-4 was fine doing stall turns and wingovers, but on occasion, with an unfavorable wind, it wouldn't do what it was supposed to do. For competition, we decided to use a straight-ahead stall instead, as we could fly it consistently time after time.

We continued to critique and perfect our maneuver sequence until we had come up with our final group of maneuvers. We were both comfortable with our flight plan before we went to the event.

PREPARATION

In the days leading up to the event, Gerry thoroughly checked his radio equipment, control movements and settings, the radio's model-memory keys and all his field-support equipment. The checklist included two field chargers, extra glow plugs and glow drivers and extra fuel. We packed the toolbox with spare attachment screws, propellers, nuts, bolts and repair items such as CA glue, kicker and epoxy. When you're four hours from home, spare parts left in the workshop don't help much. Start early, and don't rush when you pack for your trip. What do you pack to prepare for an event like this? Well, we took a pole tent, a foldaway worktable and folding chairs, field equipment, rain gear (just in case) and plastic tarps to protect the models.

EVENT DAY

Always plan to arrive early; set up your tent, and assemble your models as soon as you can. There will be plenty of time to talk to the other competitors after you've finished. At most events, an aircraft safety check is required, so get this out of the way as soon as you can. Don't be surprised if the safety inspector finds common things such as screws and nuts missing. It happens to all of us, and you need to have time to make any necessary fixes.



One of the first things you should do after you arrive is to go to the registration station and sign in! Get the paperwork out of the way while your teammate starts setting up your tent and unloads the supplies.

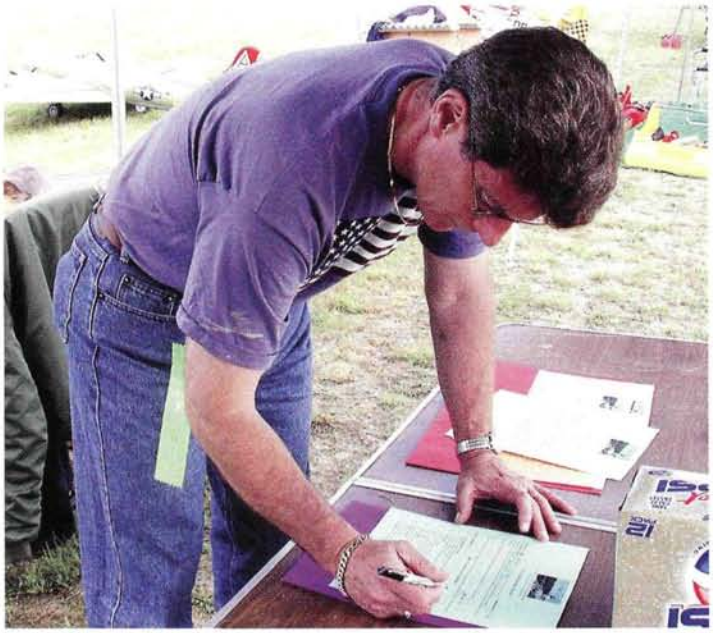


Here's the well-used Piper L-4 Grasshopper observation plane I flew. Gerry built it from a modified Balsa USA kit and powered it with an O.S. 1.20 4-stroke. It may be simple, but the L-4 is a great starting place for scale competition.

We were the fourth team to be static judged, and it sure seemed to us that the judges were spending a lot of time comparing the L-4 to the documentation. When the static judging was over, we returned to our tent and exchanged the static propeller for the flying prop. After Gerry's Fun Scale Super Cub had been checked out (a max of 5 static points in Fun Scale), we made sure that our flight orders would allow each of us to be the caller for the other. This is a small detail but one that can mess up your teamwork if you omit it.

Gerry went first in the flight order; this allowed me to gain a little perspective on the flying field and on how to best present the L-4 during Team Scale. I noted the wind conditions and where to position the plane to make turns so we could make the best presentation to the flight judges. This preparation was very helpful and was a team decision.

Gerry always made sure that the radio was properly programmed and that all the switches were



While Gerry set up his L-4 and got it safety inspected, I filled out the flight portion of the paperwork. Having a tent and a work table comes in handy at an out-of-town competition.

properly set up before I took control and began a new flight round. If you use a single programmable radio for two model airplanes, it's very easy to get the programs confused. Don't ask how we found this out! Always double-check your radio's settings.

My first takeoff run with the L-4 was very short, and the plane became airborne more quickly than I had expected. To help myself relax a bit and to set up the trims to my liking, I made a couple of practice circuits until I felt comfortable with the model. Once I was ready, I told Gerry, and he started calling the maneuvers for the judges, just as we had practiced. When Gerry flew, I called for him as we concentrated on flying smoothly and consistently.

Throughout the day, our flight scores improved, and we both felt as if we were flying according to our plan. In the end, we had a pretty successful weekend; we placed third in Team Scale, and Gerry finished a respectable fourth in Fun Scale. With a little teamwork and some preparation, Team Scale is a great way for you and a friend to enjoy the hobby together.

Make a checklist of items you will need when you travel to an event: take extra equipment and support gear, and don't forget those sodas and sandwiches! Even if you don't take home any plaques or trophies your first time out, you'll have a great time and learn how to improve your static scores and piloting skills. Good luck!



The line for static judging forms early and gets pretty long. Set up your work area early and get in line as soon as possible. The sooner you get the judging out of the way, the sooner you can fly.

Improve your documentation



Static scores make up half of the total points you can earn in competition. As the model's builder, you are entirely in control, and without good documentation, your score will suffer. All a static judge can do is interpret the data you give him and then use it to score your model accordingly. It's in your best interest to continually develop and upgrade your documentation and your model until they are in perfect alignment.

There are several ways to improve your static score:

- Save all your previous score sheets and keep them for reference. See what the judges downgraded your model for and fix those areas.
- Improve your score by improving your documentation. Don't confuse the judges. If there are differences between your 3-view drawings and your photos, remove the photos that show the difference or correct your drawings. If a drawing doesn't match your model, include photos that show that your model is correct.
- Add numbered stickers to your drawings that will refer the judge to your photo section. Add a section to your booklet and place the numbered photos that refer to the stickers there. Photos always supersede the 3-view drawing, and by showing the judges you have done your homework, you'll improve your static score.
- Repair any nicks, dings and scratches. Over time, little tweaks like this will greatly improve your documentation and your static score.

When it comes to scale, it's all in the details! It's all too easy to lose points because of simple "hangar rash."

Another great choice for getting started in scale competition is this Piper Tripacer. Built by John Chevalier, this beauty is ⅓-scale has, a 10-foot span and is powered by a ZDZ 60cc engine.



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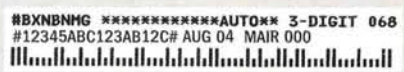
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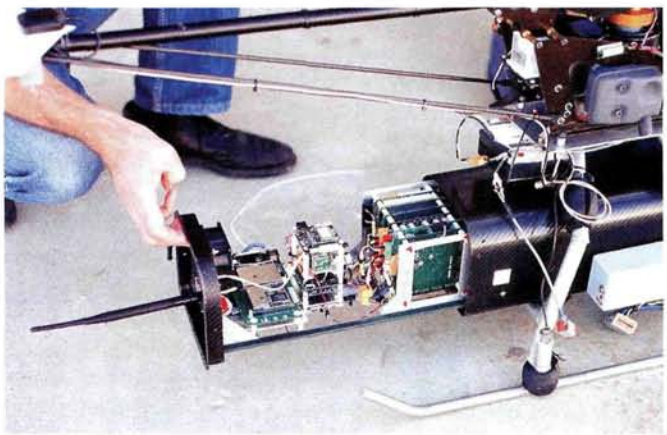
CSIRO Mantis

Multi-role UAV without a Pentagon price tag

Unmanned aerial vehicles (UAVs) are familiar to most readers of *Model Airplane News*, and their exposure on mainstream news programs has made the general public increasingly aware of this technology. Until now, though, most UAVs have been used for military and intelligence-gathering purposes, due in large part to the cost of the technology involved. An Australian group, CSIRO Complex Systems Integration, has developed a UAV that uses low-cost components that could make UAVs accessible to a much broader market. The Mantis is a compact, helicopter-style aircraft that's designed to perform tasks that are dangerous or difficult for conventional, human-piloted aircraft.

DESIGN

Much of the research for the Mantis project was done using a standard .60-size JR Ergo model helicopter. The Ergo is a suitable size to carry the Mantis's "brain"—a collection of sensors that replaces humans both in piloting the craft and carrying out its mission tasks. Electronics are the most expensive parts of a UAV; Dr. Peter Corke, one of the Mantis's designers, asserts that the electronics can cost as much as 10 times what the rest of the vehicle costs. The objective for the Mantis project was to reduce the costs to a point at which the electronics represent approximately half of the vehicle's total price. One of the principal ways costs were reduced was to abandon expensive and complicated global positioning system (GPS)-based guidance and instead to use a combination of inertial guidance and camera-based visual sensors. A GPS requires expensive equipment on the aircraft and on the ground. It can also be unreliable in places where large structures block or reflect satellite signals. The Mantis's sensor system requires less support equipment, and because it doesn't have to rely on outside signals for guidance, it isn't affected as much by obstructions.



The "brain" uses low-cost MEMS (micro-electro-mechanical systems) inertial and visual sensors, allowing fully autonomous operation. The case is fabricated out of magnesium alloy; the whole unit weighs only 75 grams!

FUNCTION

As anyone who has tried to fly an RC helicopter knows, small helis are not among the most stable craft. Because of this, one of the keys to making the Mantis a success is to make it easy to control. The Mantis can be flown conventionally; controllers govern heading and roll control, interpreting rudder and aileron stick positions as indicators of desired heading and roll angle rather than letting the sticks control the surfaces directly. But having all the controls processed through the "brain" also allows the system to operate autonomously.

Dr. Corke likens the inertial sensor system to a human inner ear because it provides balance and orientation. The visual system uses multiple cameras to gauge depth; this allows the Mantis to estimate its altitude using software specially designed for its onboard computer. Mantis also monitors changes in the image to estimate its speed. Together with the control setup, these sensors allow the Mantis to be programmed to follow waypoints along a course, to carry out search patterns, to maintain a position "on station" and even to follow relatively slow-moving objects. Fleets of these small craft could be programmed to complete tasks that have previously been assigned to a single manned craft, thus reducing the time and resources required. And because it is inexpensive, a Mantis can operate in hazardous environments without threat of significant loss.

MISSION

Unlike the complex UAVs now used by military and intelligence organizations, Mantis is targeted at civil, commercial and private use—hence, the emphasis on affordability and ease of use. Among the jobs CSIRO envisions the Mantis performing are search-and-rescue operations over large areas and in inhospitable conditions; aerial mapping and photography; power-line, pipeline and large-structure inspection; security surveillance; and fire-front monitoring.

Development continues, but the prospect of low-cost, self-guiding UAVs is exciting, and it isn't too difficult to imagine the technology translating over to our hobby in the not too distant future.